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THE GOLD MINES OF THE WORLD

(SECOND EDITION—1902)

WRITTEN AFTER AN INSPECTION OF THE MINES OF

THE TRANSVAAL, RHODESIA, INDIA,
MALAY PENINSULA,
WEST AUSTRALIA, QUEENSLAND, VICTORIA,
NEW SOUTH WALES, TASMANIA, NEW ZEALAND,
BRITISH COLUMBIA, THE KLONDYKE,
UNITED STATES, ALASKA AND MEXICO

BY J. H. CURLE

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CHAPTER I.

INTRODUCTORY.

The first edition.

IN the first edition of 'The Gold Mines of the World' I described the mines of the Transvaal, Rhodesia, West Australia, Queensland, New Zealand, British Columbia, and India.

New mining countries described in present edition.

Since writing that I have revisited most of these countries, seeing some new mines and many of the old ones, and have also inspected the mines of Victoria, New South Wales, Tasmania, the Malay Peninsula, the Klondyke, Alaska, the United States, and Mexico.

This ground covers, in a sense, the 'gold mines of the world.'

Countries not yet visited.

Russia.

The only important gold-producing country I have not visited is Russia. But, as a matter of fact, there are hardly any mines in Russia; all the gold is found in alluvial, or 'placer' deposits, close to the surface, and only one or two attempts have yet been made to sink deep shafts.

The other countries that I hope some day to inspect are China, Japan, Corea, the Dutch Indes, Hungary, South and Central America; but these are only small gold producers, and, as yet, English capital is not sunk in their mines to any extent.

West Africa.

Of West Africa, it is too soon yet to speak; it will be five years before we know anything definite about its value for gold. Personally, before going there, I am prepared to wait until science has exterminated the anopheles mosquito, for the risk of malaria is a serious one.

Number of miles travelled.

Since the latter end of 1897, when I left Johannesburg to start on my travels, I have covered a distance of 150,000 miles, at the rate of over ninety miles a day. But new mines are always being discovered, or old ones going wrong; and I can see years and years of travelling still ahead if I wish to keep in touch with this wonderful industry.

Number of gold mines inspected. I have inspected the underground, or 'open cut' workings of three hundred and sixty-five gold mines. These are located as follows :—

South Africa.	*In South Africa.* ...	Transvaal ...	89	
		Rhodesia ...	19	
			——	108
Australasia.	*In Australasia.* ...	West Australia ...	50	
		Queensland ...	40	
		New South Wales	3	
		Victoria	35	
		Tasmania ...	4	
		New Zealand ...	25	
			——	157
Canada.	*In Canada.*	British Columbia	16	
		The Klondyke ...	11	
			——	27
The East.	*In the East.*	India	13	
		Malay Peninsula...	7	
			——	20
The States.	*In United States.* ...	Montana... ...	2	
		Colorado... ...	18	
		Utah	2	
		South Dakota ...	3	
		California ...	15	
			——	40
Alaska.	*Alaska*	Alaska	7	
			——	7
Mexico.	*Mexico*	Mexico	6	
			——	6
				365

Other mines inspected. In addition to this I have seen a number of silver, lead, copper, zinc, tin, coal, and diamond mines, in many of which gold is recovered as a minor product. To see these gives one valuable experience, and is a help in forming a mining judgment; but a description of them does not come within the scope of this book.

Exploration and finance companies.

Neither do I write about the exploration and finance companies.

Gold as compared with other metals.

Gold is the one satisfactory metal to deal with. Not only is its price a fixed one, but it is usually found in ores that are more cheaply treated than either the ores of silver, lead, copper, tin, or zinc. Pure gold—gold of 1,000 fineness—is always worth £4. 4s. $11\frac{5}{8}$d. an ounce, and the holder of shares in a gold mine knows that the product of his mine can always be sold on this basis. But the price of all these other metals is continually fluctuating, and a profit one month, by a change in the metal markets, may easily be turned into a loss the next.

Therefore I stick to gold.

The Index.

More mines are described than have actually been inspected—the reason for this.

The Index at the end of this book enumerates far more than three hundred and sixty-five mines. In many cases I have had reports, plans, or other valuable information given me about mines I was unable to visit. These have been put before me in such a way that it was possible to form a correct opinion about the mine in question even without visiting it. In a country like the Transvaal, too, where I lived for years, the history and prospects of every mine are so familiar to me, and I have had such frequent access to assay plans or other data, that actual inspection of the mines underground would tell me nothing new. Many of the deep level mines at the Rand, and new mines in other places, that are referred to in this book, have, as yet, no underground workings. These, although I may write about their prospects, I naturally could not inspect.

And, added to all this, there is a certain freemasonry among mining men, whereby one can learn, if he only meets the right people, the inward and true position and value of every mine in the world. Each mining man you meet probably knows the truth or all that there is to know—about at least two or three mines; and if he can do so without hurting his employer's interests, he will generally give this information to another mining man who asks for it. I *have* met the 'right people,' I believe, so that my references to mines I have not visited can nearly always be traced to accurate sources.

The *Economist*.

For the last five years I have written mining articles, chiefly about gold mining, for the *Economist*, and much of the information in this book has appeared in its columns in a somewhat different shape. I have found that my connection with that paper is a password to the confidence of many people.

The world's output of gold

The output of gold in the world is about 16,530,000 oz. fine. In England this is equal to £4. 4s. 11⅝d.; in the United States to $20·67 an ounce.

is now £70,000,000 a year

The gold-mining industry, therefore, adds about £70,000,000 a year to the world's wealth.

The production of different countries.

This amount is divided as follows*:—

		OZS. OF FINE GOLD.
Produced by British Empire (say)	...	10,122,000
,, United States and Alaska	...	3,781,000
,, Russian Empire	.. ...	1,117,000
,, South and Central America	...	517,000
,, Mexico	. ... .	455,000
,, China, Japan, and Korea		348,000
,, Europe other than Russia		110,000
,, Various	. .	80,000
Total		†16,530,000

Gold production of the English-speaking nations

These figures are worth studying. They show the [illegible] the value to Great Britain of the gold-mining industry, and the [illegible] the fact that the English-speaking people produce nearly [illegible] of the world's gold. Is it a coincidence that the English-speaking people have secured all the countries richest in gold, or may we assume that when other countries are prospected and worked in a thorough way, they will yield far more gold than they do now? I think [illegible] that this assumption would be the correct one.

---

* [illegible] these figures [illegible] [illegible]

† [illegible] at New York [illegible] quoting the Transvaal

Will there be an increase in the gold yield of non-English-speaking countries?

If British, or United States mining methods were applied to Russia, Siberia, Hungary, China, Korea, the Dutch Indes, Asia Minor and South America, I think the output of gold from these countries, in ten years say, would be much greater than it is now.

But, even then, the energy to do this, the mining knowledge, and probably most of the capital required, would still be supplied by the English-speaking peoples.

Gold yield of the British Empire analysed.

The British Empire's share of the world's yearly gold production is now nearly 60 per cent. Add to this the yield by English-owned mines in foreign countries, and the total is raised to 69 per cent.

This is made up as follows:

		OZS. OF FINE GOLD.
Production of	African possessions (*say*)	4,618,000
,,	Australasia	3,554,000
,,	Canada and Newfoundland	1,352,000
,,	India	448,000
,,	British Guiana	111,000
,,	Borneo	17,000
,,	Malay Peninsula... ...	16,000
,,	United Kingdom ...	6,000
		10,122,000
Approximate production from English-owned mines in foreign countries		1,328,000
	TOTAL	11,450,000

Foreign capital in British mines.

Against this must be noted the fact that there are American, French, and German shareholders in many of the best English-owned mines.

Is our gold-mining industry a credit to us?

As to whether we British have any right to be proud of the way we handle our gold industry, I shall deal with under the heading 'Ethics in Gold Mining.' The energy we put into the search for gold, and the way we develop new countries, is all right; the skill we bring to bear is all right, too; but as to the dishonesty of much of the share-dealing, and the flotation everywhere of worthless mines, there is nothing in that to be proud of. London is the canker at the root of all that is worst in our gold-mining industry; but all over the Empire, whether in Ballarat, or Toronto, or Hong-Kong, or Bulawayo, there is only too often in mining matters a lack of straight dealing as between man and man. Of *that* we cannot be proud.

A summary of gold-producing countries to-day.

Let me show, in a brief summary, the present position of the world's gold-mining industry.

The Transvaal can increase its yield easily to £25,000,000 a year. This increase will come from the Witwatersrand solely. The outside districts will be actively developed; but their capacity is well-known, and but few outside mines will be added to the list of payable ventures. The Rand yield can be kept up for many years.

Africa.

In Rhodesia the yield of gold will go on increasing for several years; but most of the mines contributing to this will be small mines, liable to run short of ore reserves and be shut down after a year or two's work. The real extent of the gold industry in this country can hardly be gauged yet.

In the Soudan efforts are being made to start gold mining. In West Africa there is a present activity in gold mining. Sound mining men will defer judgment of the country, because for five years to come not much real development will be done. Development of this country must be hindered by the climate, the want of roads and railways, and the unreliability of the natives where hard work is concerned.

Abyssinia is spoken of as a likely gold country. In 1900 its production was given at 20,000 ozs.

Madagascar, has as yet, only a small gold output. When I was there five years ago I made enquiries as to this, with disappointing results.

Australasia.

West Australia has become a big gold-producing country. The metal is spread over suc [illegible] area there that I believe its yield will increase. Pros [illegible] ery year further into the desert, and always [illegible]

RAILWAY AND MINE, ROCKY MOUNTAINS

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R. \\

The meta
yield will
the desert, and

Queensland is rather disappointing at present. Its great mineral belt needs prospectors and capital. Valuable finds of gold surely remain for the future in that part of the world.

Victoria has many hundreds of small gold mines, but no great ones. The production there ought to be kept up for some time.

New South Wales, South Australia, and Tasmania, do not yield much gold, and are not likely to increase their outputs.

New Zealand has only a few payable quartz mines ; but its gold-dredging industry is still a profitable one.

New Guinea, on the mainland, has too deadly a climate to allow of a regular mining industry. The discoveries on adjacent islands are of small value.

The East.

India continues to do well, but the whole industry is still concentrated, at full pressure, within five miles of reef. Several outside goldfields are known, but carry very low grade ore.

The Malay Peninsula appeared to me disappointing. The pay chutes do not seem to go down.

The Dutch Indes are suffering from wild company flotations --engineered in Batavia. Out of it all has sprung one certainly good mine in Sumatra, and several possibly payable mines in the Celebes and Borneo.

China is still in the alluvial state ; but there are quartz reefs in the North which may become valuable. Japan is a small producer only. Korea is thought to show the best prospects for gold of any of the far Eastern countries. Its output for 1900 is given as 77,000 ozs. Americans are now prospecting there and also in the Phillipines.

United States and Alaska.

In the United States the output of gold is still increasing. This is due largely to the re-working of low grade mines--hitherto thought unpayable—by improved methods. The yield of gold as a secondary product from copper and silver ores is also getting greater.

Alaska has gold mines on the islands lying off its coast ; and placer deposits are worked all the way up the valley of the Yukon. This country is being prospected in many places, and I believe quartz mines will yet be found on the mainland.

Canada.

British Columbia has not fulfilled expectations. Three years ago its gold mines looked more promising than they do at present. The Atlin hydraulic field may prove successful.

Ontario mines have failed, almost without exception.

In Nova Scotia the yield of gold increases very slightly. It is now 30,000 ozs. a year. The Klondyke has passed its zenith. Its production, in 1900, of over a million ozs. will never again be reached, but there is still work for years ahead on the lower grade gravels. Outside districts in the Yukon Territory are beginning to be opened up with moderate success, but, as yet, no payable quartz reefs have been found.

Mexico.

Mexico is a great mineral country. Whether its future lies principally in its copper and silver, rather than its gold mines, is yet undecided. There are, as yet, only a few important gold mines, but the number is growing. In 1900, the yield of gold was 455,000 ozs.

Central and South America.

We know little of the possibilities of the Central and South American Republics. Brazil, where the best gold mines are English-owned, leads the yield, followed by Columbia. The government of these countries is considered almost an insuperable obstacle against successful mining.

A mining book from the financial and share-value point of view, rather than the technical.

In writing this book, and particularly in giving a description of any mine, I have tried to make the mine's value apparent to the shareholder, rather than write for other mining men on technical matters. This is not a work on geology, or mine timbering, or machinery, or modern mining processes, because all of these subjects have been written about by experts in each branch. It deals with mining rather from the financial than any of these other sides. I suppose I ought to call myself a specialist in 'share values.' I have tried to give every shareholder, or would-be investor, an answer to that very relevant question, 'What is the value of such and such a mine. Shall I buy the shares; or shall I sell those I already have?' This, I take it, is what he most wants to know. After all, the money-making side of mining is *the* important thing; and therefore, dealing with that as I do, there is no need to apologise for a lack of description of details.

No individuals are mentioned —the reason for this.

I follow the example, which I set in the first edition, of mentioning no persons by name. Mining criticism of individuals, as I read it in books, pamphlets, or newspapers, is very apt to run to seed—to degenerate into mere gush, with here and there just a suspicion of advertisement. But that does not make me blind to merit. When a manager shows me a well-kept set of mine plans, or an exact cost-sheet; or an engineer, a well laid-out plant; or a mine foreman, a cleanly-worked stope—I make a mental note, and it goes to the mine's credit in my final estimate of its value.

A well-deserved tribute to those who work our gold mines.

Now let me—without the mention of names—pay a well-deserved compliment to the thousand or so mining engineers, managers, mine foremen, engineers, cyanide managers, surveyors, assayers, accountants, whose work I have inspected, and who have so materially assisted me in my work.

Managers.

The average mine manager, whether in South Africa, or Australia, or the East, or America, or wherever I have met him, is a self-reliant, capable man. Of course there are exceptions. Some managers are not capable: some are not even honest—but, as a rule, those in actual charge of gold mines to-day are men who can be relied on. The special knowledge required by these men has to be almost encyclopædic in its range, while a strong grasp of the springs of human nature, the knack of choosing good lieutenants, the exercise of great tact, and the ability to *govern*, are all necessary requirements. To my mind the most valuable essential of all in a mine manager, and that an attribute which is often subjected to a severe test, is honesty. I am pleased to think that I number as friends and acquaintances many mine managers all over the world, who *are* honest men, and who have, over and over again, to their own detriment, refused to do what they considered unworthy their position as managers and gentlemen.

Mine captains.

But I do not wish to confine my praise to the managers only. The mine captain, whose valuable qualities are known rather to the manager than to outsiders, is usually a most capable man, and devoted to his work. Many and many a time, after his hard day's work should have been over, has a mine captain cheerfully started off with me on a three or four hours' inspection of his workings, only too delighted to oblige, and asking merely that his visitor should show an intelligent interest in what he saw.

Other members of the staff.

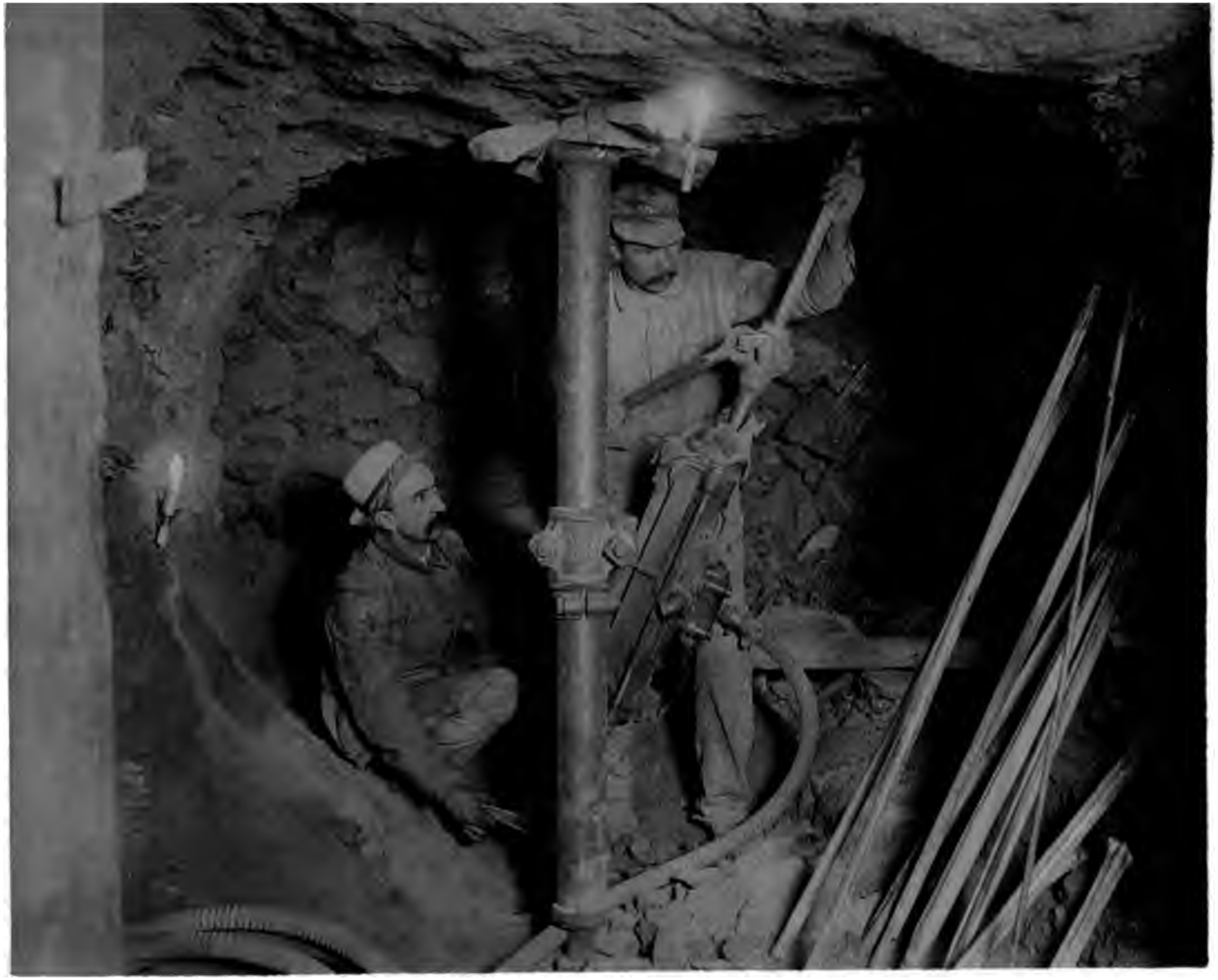
To these men, and to the other heads of departments—to battery managers, cyanide works managers, assayers, samplers, surveyors, office staff—I owe a great debt, for much service cheerfully rendered me, and for the example of good work done day after day, year after year, with always a strict sense of duty, and a loyalty towards the company which shareholders often do not fully appreciate.

For the directors of companies who sometimes try to corrupt these men I have a strong contempt.

The miner:

I wish I could write as favourably of the miner as of those in authority over him. The miner who does his day's work to the best of his ability, and who saves his money with the idea of bettering himself, is in a minority. The average workman has a weak sense of duty: he is jealous of his employer's better position; and joins a labour union in the secret hope that it may be able to thwart the schemes and lessen the profits of the company from which he earns his living. The rate of pay for a miner on nearly every gold mine is high. In Australia it varies from 45s. to 70s. a week. In the United States even the unskilled worker draws $3 a day. In India, the Transvaal, Canada, it is as much as this, or even more. A good worker, too, can always make a bigger wage than this by taking a contract. But only the few get any good from this high wage. The steady men save their money. In course of time they build a house and have a bank balance; a good many, too, find an opportunity to buy shares with their savings. But the majority literally squander their wages on drink or gambling, and live from hand to mouth all the time. No miner need be a poor man, or consider himself an inferior being. After each year's work he can easily lay aside quite a substantial sum, and at thirty years of age this accumulated money ought to bring him in a decent income.

My sympathies were originally on the side of the miner. My personal experience in America, how [illegible] more especially



FIXING A ROCK DRILL, MERCUR MINE, UTAH

Australia, has shown me that the majority of miners to-day are lacking in a sense of duty, and they are only too glad to see their employers' affairs going wrong. Many of these men are Finns, Poles, Slavs or Italians, from whom we cannot expect much; but, unfortunately, there are thousands of English and Americans who are led by these men, and the breach between labour and capital in English-speaking countries continues to be a very wide one.

he is generally lacking in a sense of duty.

I suppose that Government recognition of the miners' labour unions is the thing that would do most good. With this would be included the liability of the union officials for the acts of the union. The taking upon themselves of a real responsibility would probably have a bettering effect on these men—at present their acts are usually the acts of irresponsible beings.

Labour unions.

In this second edition, I am giving no account of many of the poorer mines in West Australia, Queensland, New Zealand, British Columbia, and elsewhere. I had to inspect many of these once; but as I have not seen them again, and as there is nothing new to write about them, I am now leaving them out altogether.*

The poorer and shut-down mines.

It is not possible to keep up to date with all gold-mining developments. Mines are continually changing—only too often for the worse. In this edition, I accentuate the extreme dangers that beset the speculator in shares, and show that some day or other every mine must come to an end. This is too often forgotten, more especially by shareholders in the best mines. The pessimistic side of the question is the right one nine times out of ten!

The dangers of mining.

What a work we have before us in ridding the industry of the guinea-pig—the worthless director! We wonder that America is outstripping us in everything. But take even this question. In America the director is a business man, often a mining specialist, and always an executive head. With us the London director is a titled person, or other sort of dummy, with no business or mining experience, and simply put there to decoy. Why *do* we continue to keep these men in power?

The guinea-pig director must be got rid of.

---

* The 'Mining Manual,' published every year in London, is the best guide to the affairs of these hundreds of small, and mostly worthless mines. I have found this a valuable book of reference.

Here is a quaint little story :—

The story of a chairman.

The Rt. Hon. the Earl of———, Chairman of the Chapultepec Gold Mine, sat one day in the company's office. He was signing scrip transfers : it was the thing he was best at of all his duties. As he sat writing, a look of extreme sagacity came into his face, and all his mining knowledge shone out of his eyes. 'Mr. Secretary,' said he to the young man standing beside him, 'our manager has several times lately in his reports used the word "stope." I do not remember to have heard this word before. *Can you tell me what a stope really is?*'

CHAPTER II.

THE GOLD MINES OF THE TRANSVAAL.

Early gold discoveries

IN 1870, prospectors in the northern district of Zoutpansberg were the first to find payable gold in the Transvaal. In the following year, the discovery of the alluvial fields at Pilgrim's Rest, and Mac-Mac, in the mountains of Lydenburg, led to a big rush from all parts of the world, and from that period onwards the Transvaal was included among gold-producing countries.

Pilgrim's Rest.

Mac-Mac.

Moodie's.

Barberton.

1886: discoveries of banket.

About 1884, reef gold was found in a number of places on Moodie's Mountain, and on the adjoining hills of the De Kaap range, and a new quartz mining field, with Barberton as its centre, came into existence. From 1886 onwards, a series of discoveries, principally of 'banket,' or reefs of water-laid pebble formation, was made: Witwatersrand, Klerksdorp, Potchefstroom, and Heidelberg districts were all found to contain these banket beds. Explorers later on opened up the quartz reefs of the Murchison and Klein Letaba districts, and the stratified veins of Lydenburg. Less important finds were made, too, in the New Republic and Swazieland--now parts of the Transvaal—and at Malmani and Otto's Hoop near the Bechuanaland border.

Outside mining districts.

The Rand.

But long ere this, all these outside districts have had to give way in importance to the gold field of Witwatersrand--a series of banket beds nearly forty miles in length; unlimited, apparently, in depth; and payable over the greater part of the entire area.

Witwatersrand, with the fine city of Johannesburg as its centre, although only sixteen years old, long ago became the leading gold-mining centre of the world, and from its own immediate neighbourhood now turns out more gold than the United States or the whole of Australasia.

Total yield from the Rand to date.

The yield of gold from the Rand, from the commencement till the time the war began, totals £76,763,231, and is made up as follows:

1887	£81,022
1888	726,821
1889	1,300,509
1890	1,735,491
1891	2,556,328
1892	4,297,610
1893	5,187,206
1894	6,963,100
1895	7,840,779
1896	7,864,341
1897	10,583,616
1898	15,141,376
1899 to August	12,485,032

Future yield.

For a number of years to come an average yield of £25,000,000 may be with reason expected, and it is certain that there is ore in sight to ensure a large output for thirty years more.

There is no need to enter into details about the geology of the Rand banket beds. The fact remains that the gold is there, and when any two geologists are prepared to agree as to the source whence it came, it will be soon enough for laymen to study the question. In a description of the deep-level mines, which occurs later in this chapter, I refer to some of the elementary geological features about the banket beds, but pretend to no originality on the subject.

Importance of Johannesburg compared with other mining centres.

Witwatersrand to-day is ten times a greater goldfield than any other individual district in the world—not necessarily because of its greater present output, but because of its permanence. I place Cripple Creek, Colorado, second to the Rand, and Kalgoorlie, West Australia, as third; while other fields I have visited—Dawson City, Coolgardie, Bendigo, Ballarat, Charters Towers, Ohinemuri, Kolar, Rossland, the San Juan, and the 'Mother Lode,' are of still less individual importance.

157 mines on the Rand.

At the time of writing this, there are on the Rand 157 mining companies, while a number more, chiefly to work deep-level areas, are in course of formation.*

---

* *Note.*—Such companies as Main Reef East, Main Reef [illegible]son, and six more subsidiaries of Randfontein Estate have already been registered, [illegible]t quoted on the market.

Of these 157 mines, 124 are situated on the Main Reef banket beds; the majority of these will eventually be worked at a profit.

In 1898, 75 mines working on the Rand produced gold to the value of £15,141,376, and of these 40 paid dividends equal to £4,834,158. In 1899, but for the war, these profits would have been larger.

Results and dividends fo 1898.

In 1898, the following dividends, earned from actual mining, were paid by mines on the Rand:—

Robinson	£440,000
Geldenhuis Estate	295,000
Crown Reef	288,000
Ferreira	270,000
Geldenhuis Deep	225,000
Village Main Reef	210,000
City and Suburban	204,000
Bonanza	200,000
Rose Deep	170,000
New Primrose	165,000
Simmer and Jack	164,500
Henry Nourse	156,250
Crown Deep	150,000
Pioneer	141,750
Langlaagte Estate	141,000
Angelo	137,174
Glencairn	125,000
Wemmer	120,000
Heriot	111,864
Durban Roodepoort	100,000
Witwatersrand	97,500
Wolhuter	86,000
Treasury	81,000
Jumpers	80,000
Rietfontein 'A'	71,437
Driefontein	68,750
Ginsberg	64,000
United Roodepoort	60,000
Worcester	57,433
Meyer and Charlton	51,000
Jubilee	50,000
Porges Randfontein	48,750
Langlaagte Block 'B'	47,850
May Consolidated	41,250
Lancaster	30,000
New Comet	28,125
Kleinfontein	23,125
Windsor	20,000
Salisbury	10,000
Stanhope	3,400
	£4,834,158

Total debt of Rand mines.

The combined debt, in debentures or otherwise, of Rand mining companies before the war amounted to about £5,500,000.

Further capital will have to be provided, in order to bring the already floated promising mines to a producing stage, to the amount of over £13,000,000.

A Rand mining venture compared to a mining venture elsewhere.

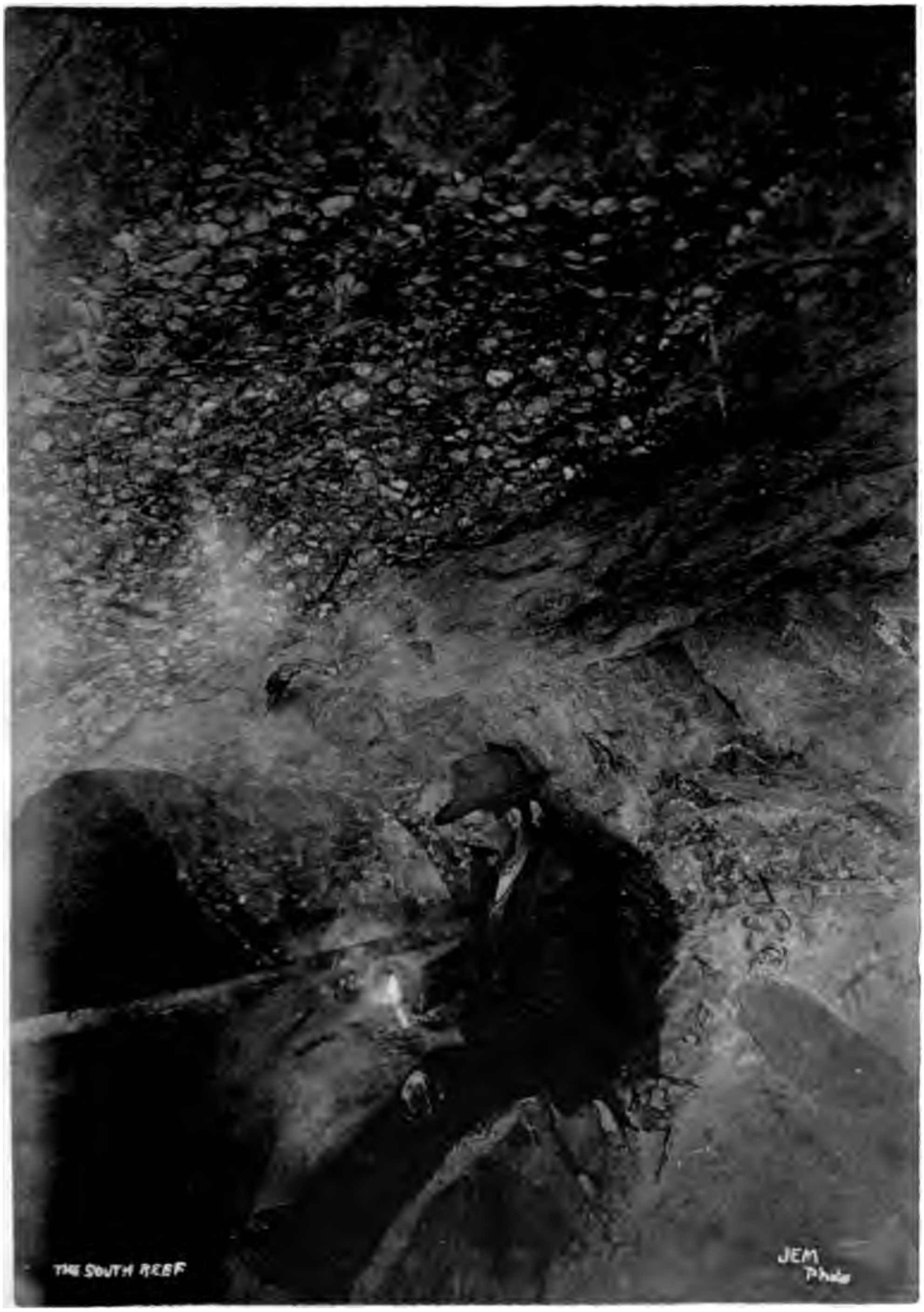
An average main reef mining venture is a legitimate venture; and even on the poorer sections of the main reef a shareholder has a better chance in the long run than a shareholder in the average third-rate gold mine elsewhere; but, of course—at a price. Most of these Rand properties, except perhaps the very best, are now standing, and nearly always do stand, quite above their intrinsic value. A Rand claim is a valuable bit of ground; but then, remember, it is only 400 × 150 feet in size, and contains perhaps 40,000 tons of ore. A 100 stamp mill will crush this in less than four months—and then the claim is worth nothing. A dividend will be paid from the profit, and the shares, instead of falling nearly the amount of the dividend deducted, will at once rise to their old price, or perhaps to a higher one. But the mine is gradually becoming worked out.

It is an exact statement to say that in from five to ten years from now a number of the richest Johannesburg mines will be worked out. In the meantime they will pay great dividends, but their valuation on the market is also great.

Shareholders must prepare to redeem their capital.

From now, onwards, shareholders in these mines *must* make sure of the redemption of their capital. These are by far the safest gold mines in the world, and in some cases the shares are still worth buying; but if the shareholder calmly goes on spending, as income, the whole dividend he receives, and makes no provision for getting his capital back, he will one day curse the name of the mine he now holds shares in—whether it be a Wemmer, or a Ferreira, or a Heriot. On the other hand, if he takes as income five or seven per cent. on his capital outlay, and sets the rest of his dividend aside, strictly for redeeming his capital, he will most certainly come out well in the end.

This extreme safety, where one may be satisfied with seven per cent. only, applies to but a few [illegible] of the Johannesburg



THE RAND. A SECTION OF BANKET ON THE SOUTH REEF.

mines. I draw a strict line between what is *certain*, and what is only good. Later on in this chapter these best mines are tabulated by themselves, and their values, on a seven per cent. basis, worked out.

A classification of the Rand mines as regards their 'safety.'

For the more speculative, there are a great many Rand mines that are good—uncommonly good when compared with mines elsewhere—but they are not yet certainties like the best.

The shares in these mines are always fluctuating—up and down —but as a rule their market valuation is more than their intrinsic value.

Then there are the poorer and unpayable mines on the main reef, and those on outside reefs. Some of these may be made payable in time, but, speaking generally, they are only gambling counters, and not to be mentioned in the same breath as the best mines.

The effect of the war on mining conditions at the Rand.

The value and earning capacity of these Rand mines before the war was known pretty accurately. Working expenses had then been reduced to an all-round cost of about 28s. per ton, or perhaps a little less.

Much political capital was made out of the heavy taxation, and especially because of the dynamite and railway monopolies. These were unjust of course, but they did not mean so much to the mining industry as the difficulties connected with native labour. This was for years the real trouble, and, unless I am mistaken, it is going to be the real trouble for years to come.

Under a new Government there will be no monopolies: there will be an efficient Civil Service: a High Court above suspicion: strict liquor and pass laws where the native workers are concerned, and a just treatment of the natives on their way to and from the goldfields. For these advantages the Government will levy direct taxation, to the extent of probably 10 per cent on the mines' profits. Even then, after this payment of 10 per cent., working costs would be lower than they were before the war.

The probable scheme of taxation.

But of course another factor has now to be looked at. We have had the war, and as a result have got a good Government and a lowering of mining costs, but the mines have most assuredly got to pay for all this.

The mining industry is the only industry in the Transvaal that will bear taxation: the whole indemnity therefore, as being the Transvaal's share in the cost of the war, will be borne by the Rand mines. The interest on this indemnity, and the providing of a sinking fund, will amount, I suppose, to some millions annually. To this add a large yearly sum for the up-keep of a military or police force in the Transvaal—also to be paid for by the mines—and it will be seen that the large savings in working costs, brought about by the war, are already mortgaged to meet these payments.

Profits on the whole are not likely to increase much.

I take it that for many years to come the money saved by lower working costs will have to be paid away by the mines in settlement of their share in the cost of the war. There will be, therefore, no increase in their earning capacity. Indirectly, conditions will be on a sounder basis, and the poorer mines may, under a graduated scale of taxation, do better than before; but the richer mines will not, I think, pay bigger dividends.

The people who control the industry will then direct their attention to the one channel by which, even then, they can lower working costs. That will be by increasing the supply of native workmen, and reducing their pay.

The whole question of native labour considered.

In British South Africa there are 4,000,000 natives—of many races. In the Portuguese provinces of Mozambique, south of the Zambesi, there are probably several millions more.

Number of natives required.

Before the war there were about 80,000 able-bodied natives working in the Rand mines; but 100,000 could have been employed. For each new stamp dropped in a mine ten more natives are needed to supply it with ore. It is not too much to assume—as so many new mines will soon be starting work—that in two years from now 150,000 men will be needed on the Rand. This makes no allowance for many thousands more to fill the needs of Johannesburg itself, the coal mines, and all the outside mining districts.

The sources of supply are :—

Sources of supply.

(1.) Natives of Swazieland, Zululand, and Natal. These are fine workers, but refuse to work underground. They are employed in surface work.

(2.) Natives of Basutoland, Cape Colony, and Bechuanaland. They are capricious, and form only a small part of the supply.

(3.) Natives of the Northern Districts of the Transvaal. They are inferior workers, but in future can be drawn on more than in the past.

(4.) Natives of the Portuguese provinces of Mozambique. This is by far the most important source of supply. These men are fine workers, especially underground : they stay on the field for a longish period, and really do the bulk of the work.

The labour question is *the* question to-day, both in the Transvaal and Rhodesia. Is the supply sufficient?

Among these people the prestige of a governing power is great. Many will come to the Rand out of curiosity, to see the change of rulers that has come about. The old workers will return: these will know that the chance of ill-treatment on the road from petty Boer officials is at an end. The chiefs, too, thinking it to their advantage to cringe to the paramount Power, will be more willing than in the past to assist the official labour agents of the Government or the Chamber of Mines.

All this will mean a good deal.

Mozambique controls the situation.

But the crux of the question is Mozambique. Here Britain is not the paramount Power, but Portugal, and here, unfortunately, dwell the majority of the best workers. Portugal has a trump card here. It is worth a big sum each year to the Transvaal, that Portugal should favour, and organise—or allow the mines to organise—a continuous supply of workers. A close understanding—with this in view—is essential between the Transvaal and Mozambique Governments, with the Chamber of Mines a third party to the agreement.

But even the resources of Mozambique will have to be organised very thoroughly—with responsible agents, subsidies to the chiefs, and food and shelter stations at regular intervals—if anything like an adequate supply of men is to be raised. I believe even then that there will be a shortage in the supply at the Rand for years to come!

Wages to the natives will be cut down.

And then the natives' wage is going to be reduced from, say, 55s. to 30s. a month. It has, indeed, already been reduced. Is he going to be satisfied with a lower wage and continue to come four or five hundred miles to work for it?

Is this a justifiable step?

This cutting down the black man's pay—as the first result of a war which many people believe was fought as much on account of the Boers' cruelty to the natives, as for any other reason—is not such a heartless act as it appears. To-day, in Natal, or the Cape, a grown native thinks anything over 15s. a month a good wage: a youngster gets about 8s.: even among the Boers, for farm work, a native got no more than this, and yet he often remained for years—a devoted servant. In the early days of the Rand the wage was not even the 30s. it is now proposed to pay; and the late high scale obtaining before the war, was fictitiously raised by mining companies bidding one against the other when short of labour.

In addition to his wage, the native gets food and shelter. What he also got in the past—vile drink—he paid for out of what may be called his surplus wage. A few shillings each month were spent on clothes, coloured handkerchiefs, hand-mirrors, sardines, sugar, or butcher's meat, but at least half of the whole—the unearned increment so to speak—went for liquor.

Indirect savings in cost of native labour.

This extra wage will not now be paid to him. The £1 a month or so, saved on every native, instead of going into the pockets of Polish publicans, will be saved to the mining companies. The native will not be drunk two or three days a week: he will be just as happy, and he will give better and more regular work than before.

Besides the direct saving in wages, there will be an indirect saving on the item of native labour of almost as much again.

Because of the new Government there can now be an organised labour supply all over South Africa: food and shelter will be supplied to natives travelling to or from the fields: they will not be molested by officials or touts: there will be an efficient pass-law, ensuring no loss to the mines by desertion: there will be no premiums except to official agents: the sale of liquor will be regulated, or stopped: the natives will work on a longer contract: they will not arrive at the mines in an emaciated condition, and there will be less sickness: it will be possible to re-introduce hand labour in stoping, instead of rock drills, and the mines will be bound down not to outbid each other for workers as in the past.

What these will amount to.

All these items—facets in a general study of extreme interest—will mean a combined saving, either in cash or in efficiency, of almost as much as the direct reduction of wage.

It is on this great problem that I see a real lessening in working costs. Reductions under all other heads are ear-marked for paying off war expenses.

The Bewaarplaatsen question—

Another thing to be settled is the question of the Bewaarplaatsen. These are areas—equal to about 500 mining claims in extent—which some mines originally pegged out as sites for machinery and tailings heaps, or for water rights, and which now, owing to deep level developments, have become very valuable.

The companies owning the surface rights on these areas now naturally wish to secure the mining rights also. These claims mostly lie in small blocks, containing the reef at great depth, and it would be impossible for new owners, who might acquire the mining rights of these areas, to work them to much advantage. The surface rights, too, belong to the companies, so that a new set of owners could under no circumstances reach the reef—however valuable it might be—except by arrangement with the present surface owners.

how it should be settled.

The solution of the question is clearly this: that the Government should offer the claims, with full mining title—or bezitrecht as it is called—to the companies interested, for from a third to a half of their estimated gross value. Should the companies refuse to take the claims on these terms, they should be put up to auction and sold to the highest bidder.

Ore-sorting :

Another problem which has now to be tackled in earnest is the problem of ore-sorting.

A reef is frequently only from 12 to 24 inches thick. To mine this it is found necessary, under the most favourable conditions, to blast down a total of 30 inches—that is to say, 24 inches of ore and 6 inches of waste rock. Usually the width blasted down, however, is more than this, averaging from 36 to 42 inches, and often when a rock drill has to be used in the stope, the total width of rock blasted down is 48 inches.

its great importance.

Assuming that the value of the 12 inches of clean ore was 1 oz. to the ton, and that of 36 inches of waste rock almost ***nil***, the value of the total product blasted down on a basis such as this would only be 5 dwts.—an unpayable result. To make a narrow reef such as this pay, therefore, it is necessary that a big percentage of waste rock be sorted out on the surface before the ore is sent to the battery. A large quantity, comparatively speaking, of waste rock must always remain in the ore product, because, in blasting, much of it is broken into innumerable minute fragments, but it is nevertheless possible to sort out a great deal and to raise the value of the product considerably. In the last two years before the war, the science of ore-sorting was getting to be better understood. Large revolving tables and belts have been erected. Over these the rock, as it comes out of the mine, slowly revolves, streams of water play upon it, showing clearly to the sorters what is reef and what is waste; and, on a number of mines, from 20 to 30 and even 40 per cent. of the whole quantity is sorted out as being valueless. The mines employing this careful system of sorting are distinguished above their neighbours by their high yields per ton, and usually by their better comparative profits. But into the minds of consulting engineers, and especially managers, is stealing insidiously the knowledge that every ton of waste rock sorted out raises the working costs on the remainder by a slight fraction, and they

Competition as to working costs militates against perfect ore-sorting.

begin to realise clearly that low working costs—the object of every manager on the Rand—and careful sorting, do not go together. Unfortunately, Witwatersrand managers—with superficial reasoning, it has seemed to me — are judged by their costs per ton of ore crushed. The man who works for 20s. per ton takes credit to himself over his neighbour who works for 22s., and yet the latter, if he chose to relinquish his elaborate sorting, might also work for 20s., or perhaps 19s. It is true that shareholders benefit at the end of the year more by the latter's method than by that of the worker at 20s., but short-sighted directors on the spot, consulting engineers even, the Press, and a great many other people who ought to know better, are inclined to praise the manager with the low working costs, and to look with cold eyes upon the really sounder man who has the courage to prejudice his working costs per ton in favour of close sorting.

Ideal ore-sorting.

But my contention is that sorting has not nearly reached a perfect stage yet. Every new mine that is being equipped should be provided with sorting tables or belts of double the area of those now in use; these tables should revolve more slowly than they do, and more jets of water should play on them. A white man, or several white men, of capacity, should be placed in charge of the sorting-sheds; the staff of native pickers should be doubled, and every bit of waste rock over the size of an inch should be removed.

Then we should have yields of 45s. and 50s. per ton from mines now producing 35s.; smaller stamp batteries—saving all the expenditure entailed by the present huge equipments—would suffice; and the profits at the end of the year would be—relatively—higher. Certainly, to superficial study, working costs per ton would not show so well as at present, but the authorities to whom the managers look for approval, would have been trained to a due appreciation of the relative values of a low working cost and a large percentage of sorting combined.

'Baby' drills in stopes.

While on this subject I may say that in America good work in stoping is being done with 'baby' drills. These are more easily moved about, and adjusted, and where the reef is narrow do not tear out the waste rock as do those of the ordinary size. They perhaps need better handling, however. I do not think these small drills have ever been in general use yet on the Rand.

Reciprocity between mining companies.

A fourth problem worth discussing, is that of reciprocity between the mining companies.

As it is, the capital expenditure on the Rand, upon surface equipments, for each individual mine, has reached an alarming and extravagant level. It is no rare thing, now-a-days, for the directors of a deep-level mine to spend £500,000 in hard cash before a single ton of ore is milled, while the expenditure on outcrop mines, too, has been little short of this. Of course, a great expenditure is really necessary, but in many cases, by the exercise of due reciprocity, a saving of from £50,000 to £150,000 to any given mine could easily be effected. Firstly, fewer shafts might be sunk. At present, by the mining law, every mine must have two means of egress in case of accident, but there is no reason why two adjoining mines might not agree to have three shafts between them—one shaft each for a main hauling-way, and the other a joint shaft, for ventilation, and for uses other than that of ore-hauling. Then, again, great facilities might be rendered between mines as regards the development of certain areas, which, from the occurrence of dykes, faults, or from their geographical position, may be difficult of access to the mine owning the same. But probably the most important saving, and this is a point I should like directors of new deep-level flotations to study, is what would be effected by the joint use—spread over two, three, or even four neighbouring mines—of battery, cyanide, and slimes plants, electric works, workshops, dams, and surface equipment generally. By means of reciprocal relationships of this sort immense sums would be saved on initial capital expenditures, and also a substantial figure on actual working expenses for ever afterwards.

How money might be saved.

Rand mines in detail.

There are, as has been already stated, 157 mines on the Witwatersrand. Many more are now in process of formation—principally to work deep-level areas.

It is a matter of difficulty to classify the mines in a way that will best show their varying values.

The course I have adopted is to classify them into three divisions, which are as follow:—

A general classification.

(*a.*) Mines on outside reefs—other than the Main Reef.
(*b.*) Mines on the Main Reef—outcrop.
(*c.*) Mines on the Main Reef—deep level.

These mines are further on tabulated to show at a glance their financial position, and they are again further sub-divided into groups.

A short sketch of the main facts about each of these mines is added. Particulars are given of debenture issues, and also a table of estimated lives, and values of the leading mines, and a short account of the factors which determine such values.

The following is a list of mines floated on reefs other than the Main Reef. The list was a much longer one years ago, especially after the 1895 'boom,' which was responsible for quite a swarm of worthless flotations on the Black Reef, Kimberley Reef, etc. Of the twenty-nine mines in this list only three—Rietfontein A, Lancaster, and Lancaster West—have any good ore in sight at present, and in the case of the Lancaster mine this ore is found rather on the Main Reef (known locally as Botha's Reef) than on the Battery Reef, on which the mine is supposed, nominally, to be working.

Mines not situated on the Main Reef.

WITWATERSRAND MINES SITUATED ON REEFS OTHER THAN THE MAIN REEF SERIES.

Statement as to the Financial Position.

Reef.	Name of Mine.	Issued Capital (£1 shares).	Debt and Debentures.	Remarks as to the Financial Position before the War.
		£	£	£
Black Reef ...	Midas East ...	175,000	—	45,000 in hand.
	Midas Deep ...	150,000	—	50,000 ,,
	Middelvlei ...	175,000	—	12,000 ,,
	Middelvlei Deep...	90,000	—	10,000 ,,
	South-West Randt	185,387	—	30,000 ,,
	Apollo	180,000	—	30,000 ,,
	Cornucopia ...	100,000	—	2,000 ,,
	Rand Southern ...	80,615	8,000	7 % Debentures.
Battery Reef ...	Rip	111,950	—	
	Lancaster ...	300,000	180,000	Option on Reserve Shares to Redeem Debentures. Profit earning.
	Lancaster West ...	195,000	—	Profit earning.
	Violet	150,000	150,000	Options on 250,000 Reserve Shares.
	Randt (5s. shares)	80,000	—	
	Rand Junction ...	125,000	—	25,000 Shares have 15s. unpaid liability.
	Horsham... ...	190,000	45 000	Company has given a two years' option to reconstruct.
	Vulcan	90,000	—	2,000 in hand.
	Lindum	500,000	—	70,000 ,,
Kimberley Reef	Great Britain ...	100,000	—	5,000 ,,
	Gordon Estate ...	92,000	—	20,000 ,,
	Bohemian ...	130,000	—	2,000 ,,
	Elandsf'ntein No. 2	120,000	-	
	Randt Reefs ...	150,000	-	
	Rand Roodepoort (10s.)	60,000	—	
	Leeuwpoort ...	95,000	—	2,000 ,,
	Rand Central ...	200,000	—	60,000 ,,
Du Preez Reef	Rietfontein ...	270,000	—	Owns Riet. A shares.
	Rietfontein A ...	317,500	—	Profit earning.
	Alexandra Estate...	250,000	—	25,000 in hand.
	Waterfall (5s.) ...	25,000	—	Profits from Claim Licenses.

Outside mines are dangerous investments.

Speculators at a distance should not touch the shares of any of these outside mines. In individual cases they may be made successes, or temporary successes, and at times they form good enough speculations for those on the spot, with an exact knowledge of all that is going on. But if investors in Europe buy these shares they will, in all probability, lose their money. As regards the Black Reef, eight miles to the south of the Main Reef series, I look on it with extreme suspicion, and would like to see every mine on this line put into liquidation.

Black Reef.

Du Preez Reef.

The Du Preez reef is narrow and treacherous.

Kimberley and Battery Reefs.

The Kimberley Reef and Battery Reef mines have this point in their favour — the reefs on which the mines were floated originally are no good at all, but under both of them the Main Reef series lies, sometimes at a workable depth. Already, in the case of the Battery Reef, which lies comparatively near the Main Reef series, the Lancaster and Lancaster West, by sinking to the latter series, have found payable ore. Other mines on the same line, when properly financed, may find themselves also in this position.

The Kimberley Reef mines are therefore being bought up for Main Reef deep-level areas. Most of these mines are situated on the dip of poor stretches of Main Reef, but nevertheless a certain vague value, in these days of deep-level dreaming, attaches itself to the areas in question.

Midas East.

Midas East.—Has a lot of cash in hand, but little prospect of finding any payable ore. The property is a large one, but of no value.

Midas Deep.

Midas Deep.—Has 465 claims. A borehole was put down cutting the Black Reef, at 800 feet, and the directors reported that the reef was twelve inches wide, assaying four ounces. This happened some years ago, and it is curious that the company has not either put down more boreholes, or preferably a shaft, as there is cash in hand for this purpose. It is probable that this is only a local patch of rich ore, which will not continue The results of working in the Midas Estate, the outcrop mine, now liquidated, were not such as to warrant the idea that the Midas Deep would ever be a payable property.

Middelvlei.

Middelvlei.—There is no payable ore known to exist here.

Middelvlei Deep.

Middelvlei Deep.—There is no payable ore known to exist near this mine.

South West Randt.

South West Randt.—Having found no signs of payable reef locally, the directors thoughtfully invested most of its intact working capital, some £60,000, in a series of New Zealand mining shares. They, for reasons best known to themselves, selected the most worthless of all the bad New Zealand mines, for this essay in finance, and, as a result, the money so laid out must by now have vanished.

Apollo.

Apollo.—This is a typical Black Reef flotation. Fortunately there is some cash in hand which the shareholders ought to distribute.

Cornucopia.

Cornucopia.—A mine of no value.

Rand Southern.

Rand Southern.—This company should be liquidated.

Rip.

Rip.—The Battery Reef ore, worked in 1896 by dry crushing, was found unpayable. The property of the company might be included in a flotation to embrace the deep level of the French Rand, and for that reason the shares have a speculative value. There are 343 claims. Of these 52·5 claims have lately been sold to the newly-floated Tudor mine—a deep level.

Lancaster.

Lancaster.—This company has made an unexpected success of an area of ground hitherto thought worthless, but more from the Botha's Reef (Main Reef series) than from the Battery Reef itself. There is a large debenture debt, but against this are the regular profits of the mine, and a big reserve of good ore. The future promises to be successful, but the shares at high prices are not a tempting speculation.

Lancaster West.—This property is, as yet, an unknown quantity. It is expected to turn out as well as the Lancaster, and is under the same control. Until, however, the continuous results of a year's working give a definite value to the shares, the mine may be said to be over-capitalised. There are 151 claims. Lancaster West.

Violet.—A badly-managed mine in the past. The ore in sight on the Battery Reef is unpayable, but it is thought that, as in the case of the Lancaster and Lancaster West, the Botha's Reef, underlying the Battery Reef, and not yet opened out, may prove more reliable. The company is now in the throes of reconstruction. There are sixty stamps erected, but no proper sorting plant. The shares are quite speculative. There is a very large claim area. Violet.

Randt.—A poorly-financed London flotation. Some ore of barely payable value was developed, but the company ran short of funds, and the mine had to be shut down in the middle of development. There are forty-six claims. Randt.

Randt Junction Reefs.—A doubtful venture, floated in London. No work has yet been done. There is a small balance of cash in hand. Randt Junction.

Horsham.—The funds of this company were spent rather in the erection of a costly surface equipment, and eighty-stamp mill, than in the development of the mine. So far as is known, the ore developed is just unpayable, but further exploration on the reef, which is a fine regular body of ore, might be more satisfactory. There is a debt of £45,000, and the bondholders, while guaranteeing to cancel interest on this for two years, and to spend £10,000 in further prospecting work, have received an option for that period to reconstruct the company. Horsham.

Vulcan.—After a short period of working, a few years ago, the mine was shut down. It is thought that the reefs might eventually be payable, but only after the spending of a great deal of money—which the company is not in a position to do, Vulcan.

Lindum.

Lindum.--A large property of 550 claims. This mine will probably be reconstructed, and an effort made to prove the ground satisfactorily. There are stretches of payable reef known to exist, but these are not of great extent, and the country is somewhat badly faulted. There is reason to think, however, that if soundly developed, the mine might become a payable, though a low grade, venture. It is a possible deep level, too, of several of the Randfontein mines.

Great Britain.

Great Britain.—Some years ago it was thought that this company would make a success of the Kimberley Reef. A lot of ore was developed, on a wide reef, and several good patches were found. The payable section of several feet thick, however, among the mass of low grade ore, was found so difficult to locate, that the mine was shut down. Any future the company may have will be as a deep level of the Main Reef series, but as the Main Reef in this neighbourhood is poor, no great value can be set on the Great Britain claims.

Gordon.

Gordon Estate. Was recently reconstructed, and is now being bored with a view to locating the Main Reef. The country in this neighbourhood is much disturbed geologically, and it is doubtful whether any good results can be expected.

Bohemian.

Bohemian. This mine, in the same locality, is of no value.

Elandsfontein No. 2.

Elandsfontein No. 2. Owns forty-two claims on the Kimberley Reef, valueless under that head, but worth £300 each as very deep levels of Jumpers outcrop mine. The whole value of the property would therefore work out at £12,000, or 2s. on each share.

Randt Reefs.

Randt Reefs.--Owns 115 claims on extreme dip of Jumpers, and adjacent outcrop mines. The claims are worth £300 each as deep levels, making a Randt Reefs share, therefore, worth about 4s. 0d.

Rand Roodepoort.

Rand Roodepoort.—Owns thirty-seven valueless claims on the farm Roodepoort, and eighty claims, equally valueless, at Klerksdorp.

Leeuwpoort.

Leeuwpoort.—Owns sixty-five claims on Kimberley Reef. It is thought that the Main Reef series will be found here, and boring is being done in the neighbourhood. But the formation is much broken in this locality, and it is probable that if the Main Reef is found underlying Leeuwpoort, or any of the adjacent blocks of claims, it will be both broken and of poor value. The shares will be a favourite gambling counter until the mine is either proved—or disproved.

Rand Central.

Rand Central Mines.—These areas adjoin Leeuwpoort, and the same remarks apply here also. Boring is in progress, and the Kimberley Reef has already been located at a shallow depth. It is improbable that the Main Reef will be found here of any value.

Rietfontein.

Rietfontein.—Owns a large estate and claim area—on Du Preez Reef. The most valuable area was floated off as Rietfontein A, for which the Rietfontein received 169,029 shares. These form its only valuable asset. The reef in Rietfontein has so far proved unpayable. There are forty stamps—now hung up.

Rietfont

Rietfontein A.—This company has done well for the last two years, although much troubled with a broken reef. The locality is not a safe one for investors to go into, and the shares, whatever the immediate prospect of the mine, should be left alone.

Alexa

Alexandra Estate.—This company's assets of value consist of its estate and its tree plantations. The reefs have been found to be valueless.

Wat

[illegible]—Owns a freehold estate of 1,917 acres is a small yearly revenue from claim licenses, but there is no reason to think that the reefs on the property are of any value.

So much for the outside reefs of the Rand.

The Main Reef series.

The *Main Reef* series extends for a distance of forty miles, between Klipfontein on the east, and Randfontein on the west. With the exception of two big blanks in the formation, one at Boksburg where a mass of dolerite has intruded, or overflowed, and the other at Roodepoort, where the whole formation has been thrown several miles north, the series may be said to be perfectly regular.

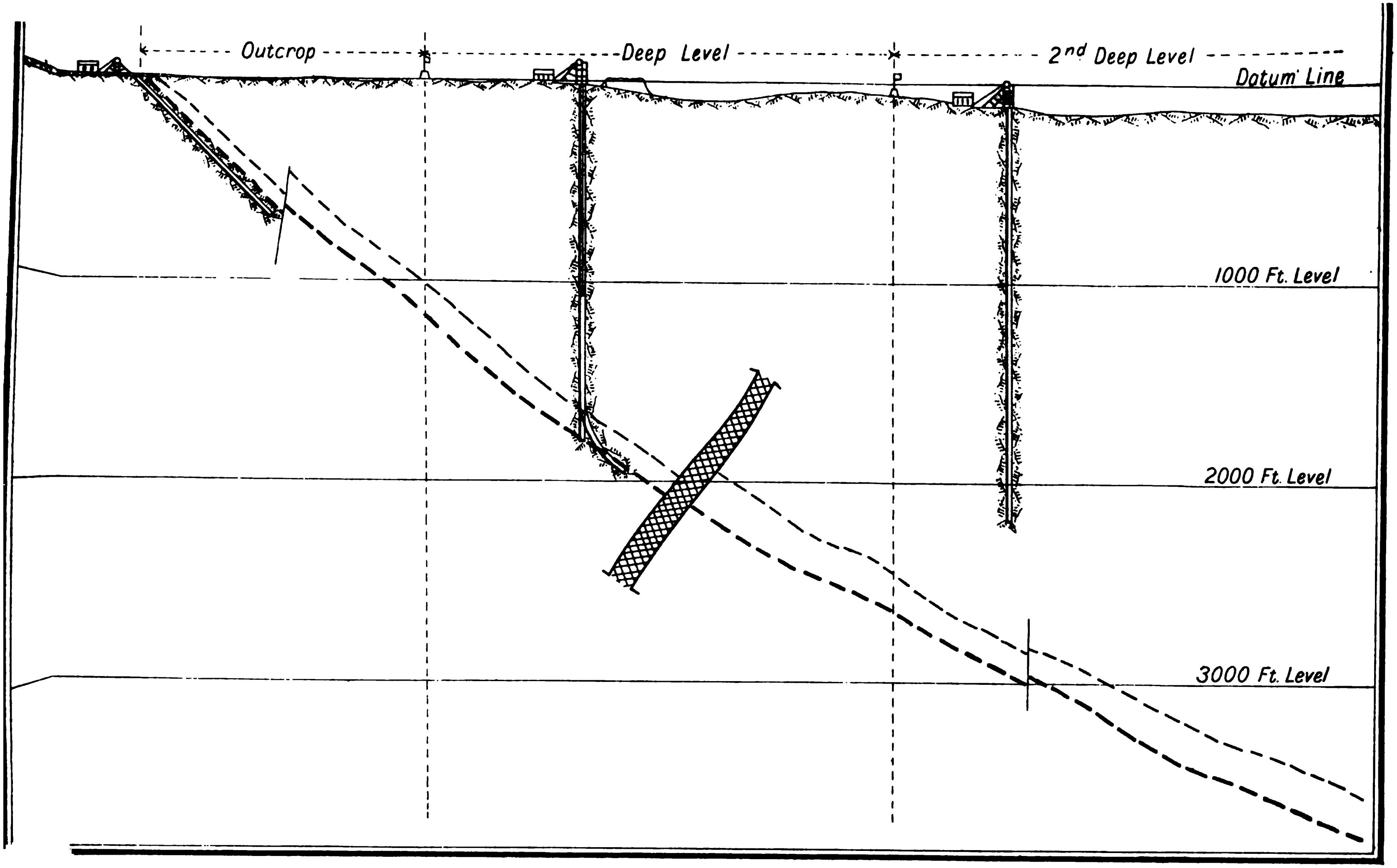
Beyond the extreme points mentioned, the continuation of the series has not yet been found. Without doubt it exists for many miles further in each direction, but the formation has either been badly broken, or the outcrops are hidden under a great depth of soil, or the reefs have narrowed down to mere stringers. Nor does it follow that the continuation of the Main Reef—even if found—would be payable. Of the last ten miles, east, on the already proved stretch, not more than two miles in the aggregate carry payable reef, and on the west nothing of value has ever been found beyond Randfontein. I am inclined to think that no other important stretch of the Main Reef will ever be found to carry payable gold.

At the far east of the Rand, an apparently valuable new area of ground is being opened by the Geduld Company. But this I look on more as the deep level area of a section of reef already known. It is not an actual extension of new ground.

A list of the mines on the Main Reef.

Following this is a list of all the outcrop mines on the Main Reef; in it they are arranged as belonging to one or other of the financial groups which control them.

As I have already said, some of these mines are by far the safest gold mines in the world, and a number more are really good, without actually being quite safe. But the remaining ones are a sorry lot, on the whole, and at their present market values quite overrated.


Outcrop
Deep Level
2nd Deep Level
Datum Line
1000 Ft. Level
2000 Ft. Level
3000 Ft. Level

Each mine is dealt with in detail, and its prospects, good or bad, are summarised. The reader will see that to hold shares in *all* the Rand mines is not good business.

Further on, the deep-level mines are summarised in the same way, and also dealt with in detail.

The deep-level mines, and the way these are being overdone.

It is in these mines much of the future lies. People have *made* a lot of money in good deep-level shares in the past—they are going to *lose* a lot in bad deep-level shares in the future.

All sorts of blocks of ground—in which the reef lies at an appalling depth—are going to be floated into deep-level companies, and just as surely the public is going to buy the shares.

The deepest shaft in the world to-day is a bare 5,000 feet; but one financial group, alone, is responsible for three deep-level flotations—Bantjes Deep, South Village Deep, and South Randfontein Deep—which, I believe, will in the aggregate require shafts of over 5,000 feet! Mines of this sort would need a million pounds each before they could start to crush; these three particular mines have £350,000 between them!

But even this sort of flotation will be put in the shade later on. Already company promoters on the Rand are talking of shafts to go to 8,000, even to 12,000 feet!

People are going to los heavily over these.

It will take years even to sink boreholes to these depths. While they are going down, the shareholders will need to be buoyed up with fantastic tales of what they will find at the bottom, and then—after years of waiting, when the bore goes into a fault, showing no reef at all, or perhaps cuts a reef of hungry appearance that assays traces only—people will begin to think that the deep-level madness has gone a little too far.

> "Too sweet is the rind, say the sages.
> Too bitter the *core*."

And then will come the time when these deep-deep-deep shares are unsaleable.

MINES SITUATED ON THE MAIN REEF SERIES.

OUTCROP MINES.

Statement as to the Financial Position before the War.

	Name of Mine.	Issued Capital (£1 Shares).	Debt and Debentures.	Further Cash Required.	Remarks as to the Financial Position.
		£	£	£	
A	Modderfontein (£4) ...	1,000,000	—	—	
	Modderfontein Extension	325,000	—	?	
	Witwatersrand	352,083	—	—	Option at £7 on 22,917 Reserve Shares.
	Jumpers	100,000	—	—	
	Heriot	114,864	—	—	
	Henry Nourse	125,000	—	—	
	City and Suburban (£4)	1,360,000	—	—	
	Ferreira	90,000	—	—	
	Robinson (£5)	2,750,000	—	—	
	Crown Reef	120,000	—	—	
	Paarl Central	400,000	—	—	
	French Rand	560,000	200,000	70,000	Option on Reserve Shares to Redeem Debentures.
	Wolhuter (£4)	860,000	—	—	
	Treasury (£4)	540,000	54,000	—	Debentures.
	Bantjes	434,350	—	200,000	
	Consolidated Main Reef	711,500	120,000	—	Option on Reserve Shares to Redeem Debentures.
B	Rand Klipfontein ...	63,640	—	?	£60,000 in hand.
	Kleinfontein	231,250	100,000	—	Option on Reserve Shares to Redeem Debentures.
	Chimes West	178,123	20,000	?	Option on Reserve Shares to pay off Debt.
	Benoni	204,100	40,000	?	Option on Reserve Shares to pay off Debt.
	Apex	125,000	-	?	
	Boksburg	625,000	-	?	
	Blue Sky	150,000	50,000	100,000	Will be Reconstructed.
	Cinderella	100,000	30,000	100,000	Do. do.
	Agnes Munro	93,000	90,000	50,000	Do. do.
	Comet	225,000	175,000		Option on Reserve Shares to Redeem Debentures.
	Angelo	275,000			Recent Debenture Issue paid off.
	Driefontein	275,000			Recent Debenture Issue paid off.
C	Ginsberg	100,000			
	Balmoral	58,100	145,000		Proposed to Issue Reserve Shares to Liquidate Debt.
	Glencairn	500,000	140,000		Option on Reserve Shares to Redeem Debentures.
	New Primrose	300,000			
	Spes Bona	150,000	90,000		Option on Reserve Shares to Liquidate Debt.
	Langlaagte Royal ...	180,000	27,000	[illegible]	Will be Reconstructed.
	New Unified	150,000	30[illegible]		
	Roodepoort	175,000	40[illegible]		
	New Croesus	300,000	8[illegible]		ion on Reserve Shares to Liquidate Debt.

MINES SITUATED ON THE MAIN REEF SERIES.—*Continued.*

Name of Mine.	Issued Capital (£1 Shares).	Debt and Debentures.	Further Cash Required.	Remarks as to the Financial Position.
D	£	£	£	
Langlaagte Estate ...	470,000	—	—	
Langlaagte Block B ...	632,500	—	—	Of the Capital, £82,500 is in 8 % Preference Shares.
Langlaagte Star	250,000	—	50,000	
Randfontein Porges ...	487,500	—	—	
Randfontein North ...	300,000	—	50,000	
Randfontein Robinson ...	574,500	—	50,000	
Randfontein Block A ...	547,500	—	150,000	
Randfontein Mynpacht ...	632,500	—	150,000	
Randfontein South ...	400,000	—	—	
E				
Klipfontein	175,000	—	p	
Simmer and Jack (£5) ...	4,700,000	293,000	—	Debentures will shortly be Redeemed.
Luipaard's Vlei	210,000	150,000	—	Option on Reserve Shares to Redeem Debentures.
Eton	201,858	—	—	
F				
May Consolidated ...	275,000	—	—	
Geldenhuis Estate ...	200,000	—	—	
Princess	165,000	60,000	—	Option on Reserve Shares to Redeem Debentures.
Van Ryn	400,000	—	—	Recent Debenture Issue paid off.
New Goch	300,000	—	—	
Meyer and Charlton ...	100,000	—	—	
Aurora West	250,000	30,000	—	
Roodepoort U.M. Reef ...	250,000	—	—	
Salisbury	100,000	—	—	
Jubilee	50,000	—	—	
Wemmer	80,000	—	—	
G				
Chimes	36,444	41,000	—	Option on Reserve Shares to Redeem Debentures.
East Rand Extension ...	250,000	—	p	100,000 Shares have only 7s. 6d. paid up.
Geldenhuis Main Reef ...	150,000	—	—	
Stanhope	34,000	—	—	
Pioneer	21,000	—	—	
LanglaagtePropri'tary(£4)	100,000	—	50,000	
Vogelstruis Estate ...	200,000	100,000	—	Debentures Redeemable by Annual Drawings.
Durban Roodepoort ...	125,000	—	—	
Roodepoort West ...	40,000	—	—	
Grey's Mynpacht ...	200,000	—	—	
York	64,625	15,000	—	Option on Reserve Shares to Liquidate Debt.
West Rand Mines ...	240,000	160,000	—	Option on Reserve Shares to Redeem Debentures.
Windsor	100,000	—	—	
Worcester	95,722	—	—	
West Rand Central ...	80,000	—	—	
Champ d'Or	131,624	—	—	
stern Kleinfontein ...	*110,000*	—	p	£60,000 in hand.

In describing these mines we will commence at the east end of the Rand, the first mine being: —

Klipfontein.

Klipfontein. The company owns a freehold farm of over 2,000 acres. The Main Reef series has been located here in a number of boreholes, but much disturbed, and with almost invariable poor results. There is a small amount of cash in hand. The shares are quite speculative and have as yet no *intrinsic* value.

Rand Klipfontein.

Rand Klipfontein. Owns a freehold farm of nearly 5,000 acres, and about £60,000 in cash. The reef has been located in a number of boreholes, but always with poor results. The mine belongs to the entirely speculative Rand ventures.

[illegible]

Modderfontein Extension. Two years ago this mine was shut down, but before that a good deal of prospecting work had been done. The results showed that the reef ran through the property, but it is badly faulted, narrow, and only one small section, as the result of all the exploratory work, could be looked upon as likely to yield a profit. Owing to good developments in the eastern end of Modderfontein, Modderfontein Extension must be considered as having a certain speculative value, but there are no definite results to date to warrant the shares standing at a premium. The property is freehold over [illegible],000 acres, but only a small area of this is underlain by the reef.

[illegible]

Modderfontein. This celebrated but hitherto unfortunate mine is opening out better recently, and may now be referred to as a payable mine. The only reason, however, that can justify the excessive market valuation of the property is the fact that there are over [illegible] reef claims, and, doubtless, speculators expect that the company will sell off several areas to subsidiaries.

Modderfontein forms an excellent example of the overvaluation [illegible]. People assume that each Modderfontein claim is worth £[illegible], and that, therefore, the shares are worth, at [illegible] how many years will [illegible] and how much money [illegible] mine, and [illegible]s, whose flotation must be assumed, will be earning the £300,000 a year which will be necessary to pay a reasonable dividend on the present market valuation? Looking at the mine in a coldly impartial light, we find that half-a-million has been spent on it, and that so far it has worked, on balance, at a loss. These are the actual results to date. They are not distinctly encouraging, and yet, such is the desire of the public to gamble, and to discount any improvement by at least five years, that the shares have again become a popular speculation.

Van Ryn.

Van Ryn.—The earlier directors of this mine, in the 'boom' of 1895, showed themselves to be able originators and pioneers in the now fashionable recreation of 'flotation of subsidiaries.' They floated the Van Ryn North and the Van Ryn West, and on the strength of this the shares in the parent company were put up to £9. When the slump came, these able men again struck out a line for themselves, and showed an admiring financial world a new variation on the 'subsidiary' theme: they reabsorbed these two flotations—and still to the extreme financial advantage of the parent concern. It came about in this way. It was found that the Van Ryn North, owing no doubt to some careless blunder, *had been located on the wrong side of the reef*, and that there was no ore at all in the mine. The parent company was at that time very short of cash, in fact heavily in debt, and as the Van Ryn North had fortunately £60,000 in the bank, it was decided to rectify the awkward mistake alluded to by a reamalgamation, which was done. By this act, Van Ryn North shareholders received shares in a mine with ore in it, and the Van Ryn Company got the necessary cash. Then again, at a later period, it was found one day that the Van Ryn West was heavily in debt. As this debt had been guaranteed by the parent company, and was mostly due to it, it was necessary that such an unpleasant fact should be got rid of, so the directors of the Van Ryn, with exquisite delicacy of feeling, not only paid off the debt of the Van Ryn West, but absorbed the whole of that company, with its 80-stamp mill, and its well-developed mine, into the bargain. Now the Van

Curious finance.

Ryn exists as if these exciting matters had never taken place. It has 160 stamps; a poor labour supply; a large extent of ground; a narrow reef; and is well managed.

Reconciling these various factors, the directors have notified shareholders that when all the stamps are set to work profits of £15,000 a month may be expected. There is, however, not enough ore in sight to speak definitely of the future. The mine is a promising one.

Chimes.

Chimes.—The area of this company's mine is situated on a small broken patch of reef. This has now been worked out, and for all practical purposes the mine is at an end. Shareholders still continue looking for another bit of reef, but this is costly work, and they may tire of it soon.

New Kleinfontein.

New Kleinfontein.—A low grade mine, but with over 120 unworked ore claims. The company is soundly managed, and there is a large reserve of ore opened out. The capacity of this mine is now fairly well known, and there seems to be little chance of any considerable improvements in profit-earning. There are 140 stamps, but owing to scarcity of labour never more than 100 have been worked. With all the stamps at work, profits of £100,000 a year might be earned, but this may be reckoned as the high-water mark of production, and is not likely to be attained for some years to come. The shares at over £2 are a doubtful investment. Great damage was done to the machinery of this mine during the war. To replace this will no doubt require a new issue of shares.

Benoni.

Benoni.—There is one small patch, or chute of good ore in the mine, not enough to warrant the erection of a battery, and so far all other development, of which there has been a considerable amount, has failed to prove anything more of value. No doubt further development in Benoni is justifiable, and will be undertaken; but there is reason to consider the mine a doubtful venture, and the shares only a speculation.

Chimes West.

Chimes West.—This is another mine, which so far is shown to be unpayable, and althoug [illegible] eal more exploration will be undertaken before the mine is absolutely condemned, it is as well for shareholders to realise that the venture is a doubtful one. The reef is a fine body, and regular in occurrence, but low in value.

Western Kleinfontein.

Western Kleinfontein.—There is every reason to believe that the reef in this mine is unpayable—in fact the company should never have been floated. Practically no work has yet been done on the property, although it was floated six years ago. The directors, in not wasting their money on the mine, have shown good judgment. The working capital thus saved has been invested judiciously, and the company now owns at least £60,000 in cash and good shares. It should be liquidated.

Apex.

Apex.—The property of the company embraces the freehold of a large farm, which contains within its boundaries a coal mine, as well as numerous broken patches of the Main Reef series—which in this neighbourhood is badly disturbed. Within the last few months before the war, the explorations of the company had located what I think is the first stretch of payable reef that has, so far, been found in the Apex. On this the shares have gone to a big price. But it is too soon to assume that a payable mine will be evolved from the disturbed area owned by this company. The shares, owing to the size and geographical position of the property, have doubtless a fascination for speculators, but investors, who buy on proved results, should not touch them yet.

East Rand Extension.

East Rand Extension.—The area of this company is 1,117 claims in different parts of the poor section of the East Rand, also claims at De Kaap, Heidelberg, and elsewhere; and a holding in East Rand Proprietary shares. Boreholes put down on the principal block of ground, adjoining Apex, have, it is said, cut a reef, or reefs, of good value. There is no evidence to prove, however, that the Main Reef series (if it *does* run through the ground) is likely to be payable over any great stretch. In the meantime the shares are only a gambling counter, though, I will admit, rather a tempting one to a certain class of speculators.

Boksburg.

Boksburg Mines.—This is another company holding a large area of ground on the broken and probably poor stretch of country that exists in this part of the East Rand. The property of the company is dangerously near to the great mass of diorite which cuts right through the formation here, and which apparently is responsible for the reefs being poor and broken up for miles on each side of the centre of disturbance. All these little matters are conveniently forgotten in a 'boom,' and the public, owing merely to the geographical position of the property (the surface map does not show a mass of diorite a mile wide), will probably purchase the shares with eagerness.

Blue Sky.

Blue Sky.—The most easterly of the fine series of mines that belongs to the East Rand Proprietary Company. Readers must note that from this mine *westwards* the Main Reef stretches in a regular line for many miles, and is almost invariably of good value, while from here *eastwards*, with the exception of a patch in Apex and the Kleinfontein-Modderfontein-Van Ryn stretch, no payable reef has been found.

The reef in the Blue Sky although good, is very narrow, and is not yet proved sufficiently to justify the immediate reflotation of the company. There are forty ore-bearing claims, and eventually the mine should be a payable one. The shares are a fairly good speculation up to par.

Cinderella.

Cinderella.—This mine, consisting of forty ore-bearing claims, will be absorbed into one, or two, new subsidiaries of the East Rand Proprietary Company. The ground is good. The shares are quite a good speculation at £2.

Agnes Munro.

Agnes Munro.—Owing to the small area of this property—twelve ore-carrying claims—and to the fact that it is already in debt to the extent of £90,000, the shares cannot be considered as worth more than par; but the reef is good. The mine will be absorbed into a larger flotation.

New Comet.

New Comet.—This is a mine with 100 stamps, and about 80 unworked ore claims. Two reefs of the series, the north and south reefs, are worked, but up to the present, owing to the patchiness of the ore, the mine has been disappointing. The intrinsic value of the shares is not over £3, if as much.

Beginning in the Comet, and passing through all the mines west as far as the Witwatersrand mine, is a big dyke running parallel with the formation, and lying between the north and south reefs. There are good geological reasons for believing that this dyke originally cut the south reef in two, and that the so-called north reef of this part of the Rand is only the cut-off piece of the south reef.

What is the result of the big dyke which in thi part of the Rand runs parallel between the two reefs?

If this is so, shafts going down on the north reef, when they reach a depth of about 1,000 feet, will come up against the dyke, and the north reef will come to an abrupt end.

In favour of this theory is the fact that in places along this stretch, the two reefs are dipping at different angles. This is not usual on the main reef series.

Against the theory, is the fact that in most of the mines affected, the north reef is much poorer than the south reef. If the north reef is only a cut-off piece of the south reef, why should it not be as rich as the south reef? But it is not so by a long way!

However, the assumption—which will be proved one way or the other within a year or two—is that these two reefs are parts of the same reef, cut in two by the dyke.

The mines affected are New Comet, Angelo, Driefontein, Balmoral, Witwatersrand, and Witwatersrand Deep. Fortunately in most of these the north reef is low grade, and is not worked much yet.

The East Rand Proprietary Company ought to make an official statement on this question.

Angelo.

***Angelo.**—So far, only the south reef has been worked in this mine. The north reef is poor, and, should it be cut off by the dyke, the loss to the Angelo would not be great. The south reef is exceptionally rich, and there is a large amount of ore developed. But there are only about fifty-five unworked south reef claims, and on this reef alone, with 110 stamps, the mine will be worked out in ten years. The dividend should be 80 per cent. On these figures, based only on the south reef, the shares, to yield 7 per cent. interest and redemption of capital invested, are worth, at a conservative estimate, £5⅜.

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* Readers are referred to the assay plan of the Angelo, which appears at the end of the book.

riefontein.

Driefontein.—This is an excellent property, consisting of about 60 unworked south reef claims. The north reef in this mine, too, is poor. There are 110 stamps and a large reserve of ore developed. So far as can be estimated, the life of the mine, on the south reef, should be twelve years; the dividend 45 per cent.; and the shares, on the south reef alone, on a 7 per cent. basis, are worth £3⅜.

almoral.

Balmoral.—This property has only got north reef in its area, and, after years of work, the result, on balance, has been a loss. I do not see much chance of improvement.

insberg.

Ginsberg.—This is rather a sound little mine, and is at present working the south reef. The north reef has been located in a borehole, but this is probably north of the dyke, and may not be found to continue in depth. Assuming that both reefs exist throughout the mine, but that the north reef is as poor as in the Balmoral, the life of the Ginsberg, with fifty stamps, will be thirteen years more; the average dividend will be 35 per cent.; and the shares may be said to be worth about £2¾.

Vitwaters-
and.

Witwatersrand.—It is almost impossible to set even an approximate valuation on the shares of this company. It owns a valuable freehold estate bringing in £12,000 a year revenue; five water-rights; 400 reef claims; and a fine surface equipment, including 120 stamps. The ore lately developed in all parts of the mine is stated to be of good value, and the shares are eagerly bought by speculators.

On the other hand, the past record of the mine has been poor. Even with its increased battery it has earned indifferent profits. No doubt, in these days of the 'valuation per claim' fallacy, and the 'flotation of subsidiaries' movement, some shuffling of the cards may ere [illegible] place.

As to earning legitimate mining profits sufficient to pay a dividend on the price to which the shares have risen, *i.e.*, £240,000 a year, I do not consider the mine can do it. As a gamble the shares may be all right; in the meantime, as an investment, they are not worth more than half their price.

Glencairn.

Glencairn.—So far as is now known this mine also is low grade, but from the value of the ore being opened out in the adjoining mines, especially in the deep level, it should improve rather than decline. Only 110 out of 160 stamps were at work in 1899; the excuse given was want of labour. Assuming all the stamps at work, the life of the mine would be sixteen years more; the dividend would average 30 per cent.; and the shares would be worth £2¾.

May Consolidated.

May Consolidated is opening out, as are all the other mines in this neighbourhood, well in the lower levels. Given a regular water supply, this mine should, in the future, and until it is exhausted, never again cause shareholders anxiety.

There are about 26½ unworked claims; with 100 stamps the life will be ten-and-a-half years more; the average dividend 75 per cent.; and the shares are worth rather over £5¼.

New Primrose.

New Primrose.—This mine, as regards aggregate width of payable ore, has improved in the lower levels. Under the same management as Glencairn, working costs are low, and the future should be even more successful than the past has been. With the present 160 stamps the life is fifteen years; the dividend should average 60 per cent.; and the shares are worth rather over £5.

Simmer and Jack.

Simmer and Jack.—The controllers of this, the largest mine in the Transvaal, are always so busy, either floating off subsidiaries; or splitting up subsidiaries already floated; or issuing debentures; or paying them off again; that for an outsider it is impossible to state at any given moment either the size of the Simmer; its debt; its cash in hand; the number of shares held in subsidiaries; or even the number of such subsidiaries themselves. When the directors settle down to steady work with the 280-stamp mill, which they talk of increasing to 320 stamps, they will find that the property, fine as it is, is over-capitalised. Of the one-and-a-half million tons of ore developed, an immense quantity is of a lower grade than was ever expected, *i.e.*, it will not yield more than 8s. per ton profit, and should these poor patches continue in depth, or be found in other places, as certainly may be expected, it will be a difficult matter for the mine to keep up high yields.

My estimate of the value of Simmer and Jack shares, after paying off its debenture issue, and allowing £1,600,000 as the remaining value of its outside assets, is £5 12s. 6d. On a basis of 320 stamps, this figure would be increased, but the mine, is, in any case, an unwieldy undertaking.

Stanhope.

Stanhope.—This little property is practically worked out. It may scrape together profits, either on its last months of crushing, or from the sale of its machinery, to pay a shilling or two per share as a final dividend, but this cannot be expected with certainty.

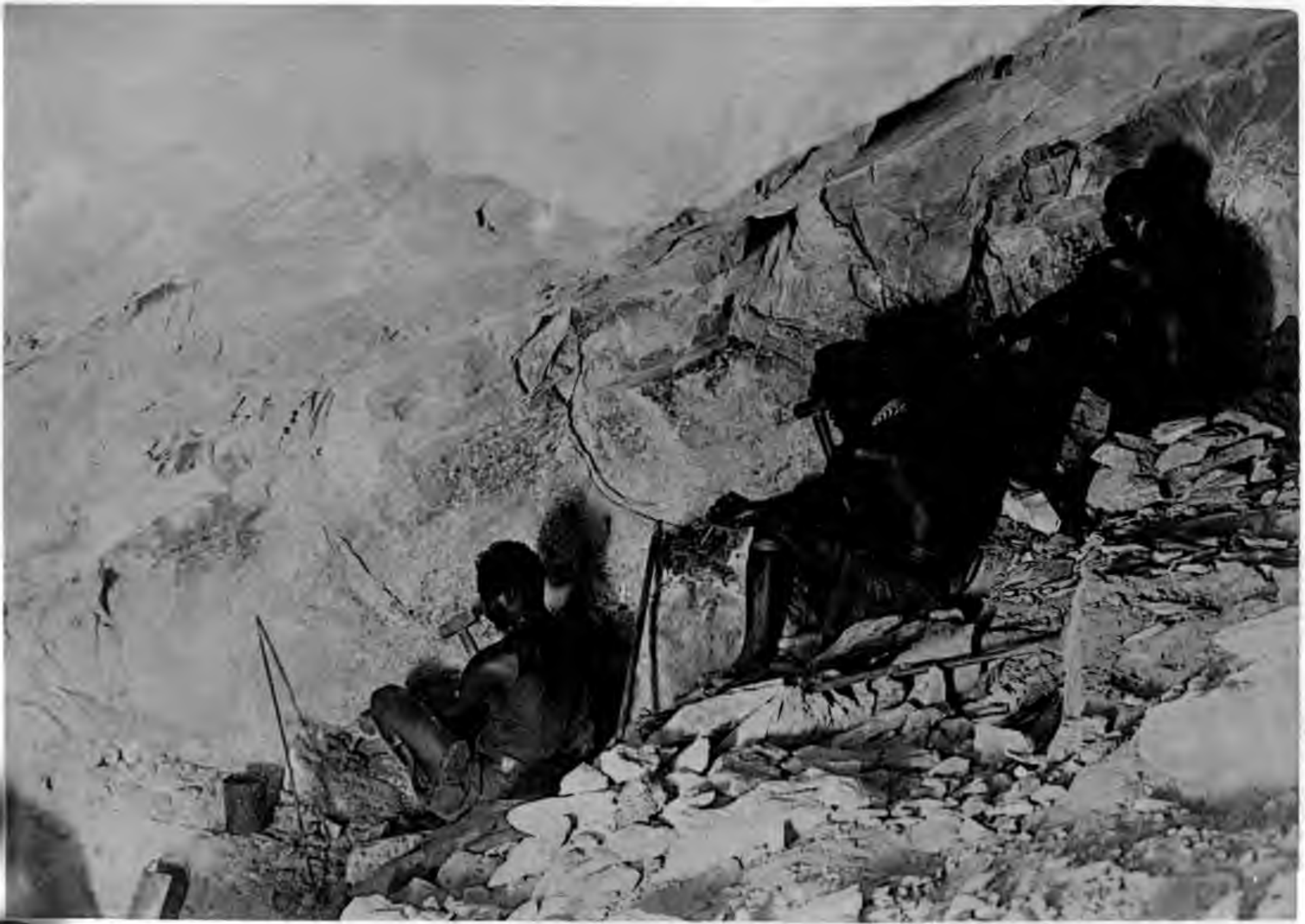
Geldenhuis Main Reef.

Geldenhuis Main.—Has been an irregularly-worked mine, and has failed to realise the profits which its controllers have predicted. Its life may be anything from four to eight years more, but I fancy that it will continue to disappoint shareholders as steadily in the future as it has done in the past. The shares are not worth 10s.

Geldenhuis Estate.

Geldenhuis Estate.—This mine has turned out a success in every way. Its capacity is now known with something like exactitude, and is comprised in the following facts :—

Life from 1902	6½ years.
Average annual dividend to be expected...	175 per cent.
Value of the freehold estate	£100,000.
Value of the shares, taking 7 per cent. dividend, and allowing for redemption of capital invested	£8½.



THE RAND—NATIVES WORKING IN A STOPE.

Treasury.—On paper, Treasury shares work out well; there is no reason to think that, in practice, the value will be found to be less. It is in a good locality, surrounded by other mines earning big profits, while the mine itself is now a well-developed, cheaply-worked venture. The company holds 5,737 Simmer West shares. The life should be thirteen years; the dividend 18 per cent.; and the value of the shares £6.

Jumpers.—The life of this mine is about four years more, during which time dividends from ore mined should average perhaps 50 per cent. The company owns 11,394 South Nourse shares. The company holds also 29,188 Jumpers Deep shares, received in exchange for twenty-three claims, and if it secures bezitrecht on its further twenty-eight claims, now held as bewaarplaatsen, it will be entitled, in exchange for these, to a further 36,662 Jumpers Deep shares, making 65,850 in all. In this eventuality Jumpers shares would be worth £5.

New Heriot.—In the last year or two the value of the ore in this mine, especially in the main reef, has somewhat fallen off; so much so that an estimated future average dividend of 125 per cent. has now to be reduced to 100 per cent. On this basis Heriot shares are worth £8.

It must not be forgotten, however, in a mine like the Heriot, that there are already 400,000 tons of ore developed, and paid for out of current working expenses. For the last four or five years of the mine's life, it will have to do no development work, and no shaft sinking, and nothing need be charged for depreciation. Under these circumstances it is probable that the Heriot, during its last few years of life, may pay considerably more than the 100 per cent. reckoned on.

I would instance the shares at anything under £8 as a sound investment.

Henry Nourse.—This mine has ore reserves developed for several years ahead, and before long all the shafts will have reached the boundary of the property. The continued good v of ore in the mine is assured. The company owns thirty-nine bewaarplaatsen, which, from their location, will probably be found to contain poor ore. Setting on these a net value, after deducting the probable cost of obtaining bezitrecht, of £1. 15s. per Henry Nourse share, I estimate that the total value of the property is equal to £10½ per share. The shares at anything under this may be considered a sound investment.

New Goch. **New Goch.**—It is stated officially that the ore now being developed below the big dyke, of which there is already a large quantity in sight, will yield good profits. Considering the past history of the mine, I cannot persuade myself that this newly-found patch of good ore is likely to be permanent, and I consider the shares speculative. There are over forty unworked ore claims, and sixty heavy stamps, but it is impossible to hazard a guess as to what profits will be for, say, the first year after the recommencement of crushing.

Spes Bona. **Spes Bona.**—For a long time past the Spes Bona has barely earned interest on its heavy debt—let alone profits. The mine is situated in a locality which has always produced poor ore. Even assuming a slightly better yield in the future, which recent assays seem to indicate, I do not suppose that the quantity of ore remaining in the mine is sufficient to pay off the debt of the company and dividends of £1 per share, much less can it be expected to yield redemption of capital invested.

Wolhuter. **Wolhuter.**—The comparative failure of this company to earn large profits is due to the fact that the most valuable reef has become, in the lower levels, a large mass, double its usual thickness, and carrying only the same aggregate of gold in its enlarged form, as it did when it was of ordinary stoping width. This is a serious matter: the reef looks well; it is of great width; regular in its occurrence; and yet it is only worth half its usual value. I do not specially instance the Wolhuter, because the same thing has occurred in other outcrop mines, and will occur ep levels also, but it serves to emphasise the fact that there *are* unknown risks, even in banket mining, and that except a mine has all its ore actually proved, either by its own development, or by the extensive workings of the immediate deep level, there *are* risks. In the face of this it is absurd to state, as many people do, that the shares of a mine like the Wolhuter, not yet proved on the dip, and exceedingly patchy, so far as is known, should be bought to yield 5 per cent. interest. I consider that 10 per cent. is the lowest interest possible on a mine such as this, and although the figures given in the table represent a valuation on a 7 per cent. basis, I think this is too little.

A patchy mine.

The only knowledge of the value of the ground below the Wolhuter and adjoining mines, is gained from the Bezuidenville borehole, which cut through the reef at 3,251 feet. The ore, as shown by the core, was hungry-looking, quartzy and assayed next to nothing. Of course, one borehole, sunk to locate the reef, not to gauge its value, is no criterion for the valuation of a mining area, but it serves to emphasise the fact that an outcrop mine not proved by the workings of an immediate deep level, is more or less of an unknown quantity, and must not be bought to yield 7 or even 10 per cent.

In the Wolhuter, the eastern ground, under the Spes Bona, is opening out rather well. Small patches of better value occur also here and there in the principal workings, and help to keep up the present average. On the whole, however, the mine is still an unproved quantity, and the shares are more or less speculative. On a 7 per cent. basis their value works out to £5. 12s. 6d.

Meyer and Charlton.

Meyer and Charlton.—A low grade mine, but with exceptionally low working costs, and a steady dividend payer. The company owned a small block of deep-level claims, divided from its present mine by eight claims belonging to the Wolhuter. These eight claims the directors recently bought for the Charlton for £105,000—a sound purchase, consolidating the area of that mine, and prolonging its life. In addition the Charlton owns nine bewaarplaatsen, but these are some distance away, and if bezitrecht is granted to them, they will be incorporated in a deep-level company.

The Meyer and Charlton, with its present 80 stamps, has a life of ten years more; it should pay an average dividend of 85 per cent., and its shares, are worth £6½. This is a sound mine.

City and Suburban.

City and Suburban.—There are two outstanding points of interest in this mine at present.

The first is the fact that, at the eighth level, an extensive layer of rock, widening at the fourteenth level to 100 feet thick, has forced itself in between the Main Reef and Main Reef Leader. The consequence of this is that the Leader, always hitherto a reef of value, has been, in places, squeezed out of existence, whilst its tonnage and value of ore between the points mentioned, has fallen to almost a minus quantity.

Notwithstanding this great loss of ore—equal to a two years' supply, the reserves in the mine now stand at half-a-million tons, paid for from current profits. A slight improvement is noticeable in the value of the Main Reef Leader in the lowest workings, but it is probable that this intrusive rock will continue to do great damage.

'atches of oor ore.

The second fact, and an equally serious one, is that, just as in the case of the Wolhuter, the principal reef in the mine, the South Reef, has widened out in the lowest levels to a mass seven feet thick, and containing no more gold in the aggregate than it did when only three feet thick.

Like the Wolhuter, the City has no deep level at work, and shareholders are quite in the dark as to what the value of the ore is between the present bottom level of the mine and the boundary. There are, of course, especially on the west side, undoubted rich patches of ore, but the average of ore now being opened out is of low grade. The policy of the company, seeing that the Main Reef Leader is now producing so little ore, is at present to mine a larger proportion of South Reef than in the past. In the upper levels, where stoping is now being done, the South Reef still maintains a medium width, and is of good value, but I am afraid that in future years, unless a change again takes place, a falling off in profits must result. I have allowed for an average dividend of 15 per cent., which errs probably on the side of optimism: for a life of twenty years: and including the value of the company's township, have consequently, placed a value on the shares of £6. 7s. 6d. But Cities are not cheap at this price.

Jubilee.—A correct estimation of the value of this mine must include the value of its various outside holdings. These comprise:— Jubilee.

(*a.*)	Village Main Reef shares ...	Value	£10,000
(*b.*)	4½ bewaarplaatsen	,,	27,000
(*c.*)	15½ bezitrecht claims—Wemmer Pan (Part of these are being sold for 25,173 shares in the South City less a liability of £12,586. The rest will be sold to the Suburban Deep).	,,	93,000
			£130,000

equal to £2⅝ for each Jubilee Share.

When we add to this a life of seven years more for the mine, with a yearly dividend of 100 per cent., we get a total valuation of £7⅞ per each Jubilee share. These shares are a good purchase.

Salisbury. This company's assets comprise:— Salisbury.

(*a.*)	Mine dividends of 40 per cent. for 6½ years more equal to £2 a share.	
(*b.*)	15½ bezitrecht claims—Wemmer Pan (Part of these are being sold for 25,173 shares in the South City—less a liability of £12,586. The rest will be sold to the Suburban Deep).	£93,000
(*c.*)	2 bezitrecht claims	24,000
(*d.*)	4 bewaarplaatsen	20,000
(*e.*)	3½ bewaarplaatsen	21,000
		£158,000

The whole is equal to a valuation of £3⅝ for each Salisbury share.

Wemmer.

Wemmer.—This mine has a further estimated life of seven years, crushing with 70 stamps; during that period it should easily pay an average dividend of over 200 per cent.

In addition the company owns the following:—

(*a.*) 36,226 Village Deep shares with a contingent liability of £60,092.

(*b.*) A water-right, which, when bezitrecht is obtained, will leave a profit to the company of £50,000.

(*c.*) 11 claims, bewaarplaatsen.

(*d.*) 8 claims, bewaarplaatsen.

The total value of the mine and these other assets is at least £14—perhaps as much as £17—a share.

Ferreira.

Ferreira.—The future of this mine has been calculated to a nicety.

For the next four years or so, milling with 80 stamps a larger proportion of the rich South Reef, it will earn dividends of 300 per cent. After that the company will take over the forty stamps of the Worcester mine, which by that time will be worked out, and milling then a larger proportion of the poorer Main Reef, but with 120 stamps, will still continue to earn dividends of 300 per cent. So far as is known, then—and in a mine proved as this is, there is no fear of a falling off in the value of the ore—the mine will pay 300 per cent. for eleven years more, and will then be worked out.

The following assets are also held:—

6 bezitrecht claims, worth ...	£240,000
6 bewaarplaatsen	150,000
2 bezitrecht	14,000
11 bewaarplaatsen	33,000
	£437,000

or equal to nearly £5 per share.

On the 7 per cent. dividend basis, Ferreiras are worth £26 a share—all assets in

Worcester.

Worcester.—This mine will be worked out in from three to four years more. It will pay 60 per cent. dividends till then, and as it owns several valuable bewaarplaatsen and other assets, the shares may be considered as worth over £3.

The company is prospecting a new mine on the De Kaap field. On this venture it may lose money—or it may spend on its equipment a lot of the money which would otherwise be devoted to dividends.

Robinson.

Robinson.—This is the leading gold mine in South Africa, and had paid in dividends, to the end of 1898, £2,630,937. Apparently its future will be even greater than its past. There are 200 stamps. There are still ninety-nine unworked claims, and a life of quite fourteen years more may be expected. The Robinson Company owns 60,119 shares in the Robinson Central Deep, received for 6½ claims.

The value of Robinson shares on a 7 per cent. basis is £10.

Pioneer.

Johannesburg Pioneer.—This mine should be finally worked out during 1902. Its valuation is:—

(*a.*) Mine dividends, yet to come ... say,	£2	per share.
(*b.*) Slimes in hand ... ... say,	1	,, ,,
(*c.*) Value of Main Reef, which may be sold to an adjoining company say,	1	,, ,,
Total -	4	,, ,,

Crown Reef.

Crown Reef.—This mine, from 1902, has an estimated life of five years, and during that period may be expected to pay average dividends of 240 per cent. An enormous dividend such as this, as I have already explained, is the result of the ending of all expenditure upon capital account, shaft sinking, redemption of plant, and development of ore—equal to, in the case of the Crown Reef, probably £100,000 a year. All these expenses will cease for several years before the mine is worked out, and of course will be reflected to the full amount in the dividends.

In addition, the Crown Reef mine owns fifty-one deep-level claims, held by bezitrecht, and 42½ bewaarplaatsen claims—worth altogether, on present valuation, £6¼ per share.

Taking all this into consideration, Crown Reef shares are worth £15¾.

Langlaagte Estate.

Langlaagte Estate.—The aggregate width of reef now worked in this mine, and at a very low cost, is sixteen feet. There are, approximately, fifty-four unworked claims, and on the present stamping capacity—200 heads—the mine will last for sixteen years more. An average dividend of 35 per cent. should be possible, and including the company's holding in such doubtful ventures as Langlaagte Exploration, Langlaagte Star, and Block B, the shares may be said to be worth £3. 12s. 6d.

Langlaagte Royal.

Langlaagte Royal.—This mine is now shut down, and heavily in debt. The reefs in this property at a shallower point were payable, but in depth they became poor, and there is now a big quantity of unpayable ore developed on all the lower levels. It is possible that an improvement might be found if the mine were developed still deeper, but it has been such a disappointment, and the company is so heavily in debt, that those in control are naturally afraid to take the risk.

The shares are quite speculative.

Paarl Central.

Paarl Central.—Month after month this mine yields returns which show no actual loss, but which are not sufficient to pay more than interest on the company's debt, which stands at £60,000. The locality in which the mine is situated contains persistently low grade ore, and there seems little hope that the mine will be really successful. There are about forty unworked claims.

Langlaagte Proprietary.

Langlaagte Proprietary.—A low grade mine, held by French shareholders, and now shut down. It is possible that this mine might pay on a small scale if well handled.

Block B.

Langlaagte Block B.—This company's ground carries low grade ore throughout. The mine has always earned sufficient profit to pay a dividend on its 82,500 8 per cent. preference shares, but until 1898 never paid on its ordinary shares. The ore is treated most economically. The mine has a long life, and the company owns 125,000 shares in the Langlaagte Exploration Company. In spite of these facts the shares are not a good speculation.

New Crœsus.

New Crœsus.—Very low grade. Recently reconstructed. An attempt, for the fifth or sixth time, is again being made to run this mine at a profit.

Langlaagte Star.

Langlaagte Star.—Another low grade mine, which is now working without a profit. Readers will note that there is a large patch of the Main Reef series here which is barely payable under any circumstances. The mines situated on this patch are Langlaagte Royal, Paarl Central, Langlaagte Proprietary, Langlaagte Block B, New Crœsus, and Langlaagte Star, and speculators should not invest in this group of mines. Beyond this area westward a slight improvement in the value of the reefs takes place. The next mine is the

Main Reef.

Main Reef Consolidated.—Such a mine as this, holding a freehold estate, and over 600 reef claims, becomes a favourite speculative counter during a strong market. To begin with, the mine itself, or rather such portions as have been exploited, has turned out successfully. It is low grade, but there is one stretch of reef proved payable for 3,000 feet in length, and this is continuing good in the deepest workings. It is, however, due to the fact that the company will issue two subsidiary companies, that speculators so eagerly buy Main Reef shares. The fascination of being able to print new scrip, whether the areas of ground represented by such scrip be good or bad, is too much for the speculating public, and it succumbs to what may be described as the 'fascination of the subsidiary.'

New Unified.

New Unified.—If this mine were properly equipped, it is possible that it would become a profit earner. To pay off the debt, and to erect a new mill and sorting-tables, would require £120,000, which sum I consider shareholders would be justified in supplying.

Aurora West.

Aurora West United.—There are 130,000 tons of South Reef ore developed, and 80,000 tons of Main Reef. The latter is unpayable, but the South Reef should yield profits of 10s. per ton. The main problem for this mine, which is soundly managed, is careful ore sorting.

As an investment the shares are doubtful.

Bantjes.

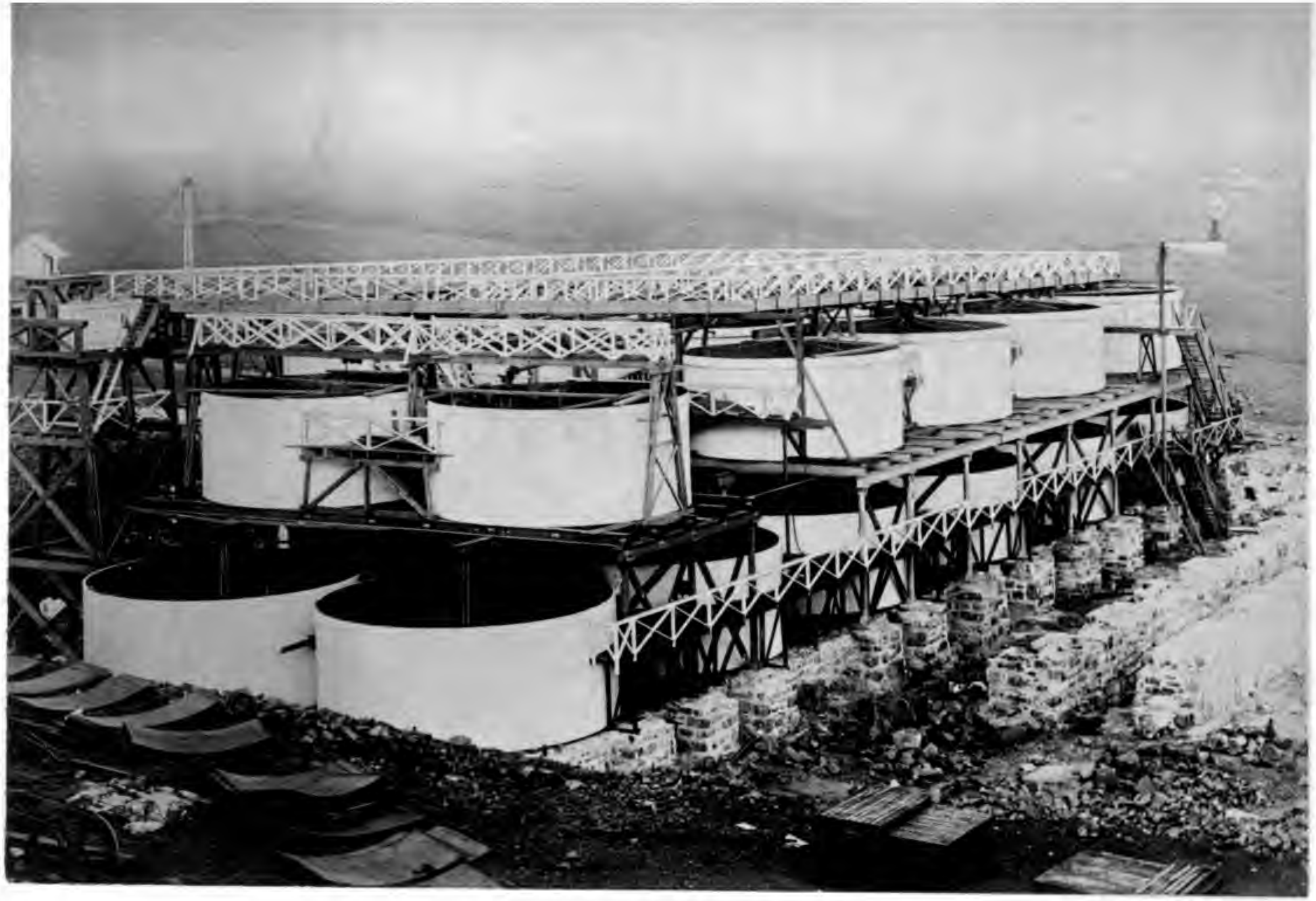
Bantjes.—The company owns an estate, and a large area of ore-carrying claims. More money is required for development, but results to date warrant neither the erection of a battery, nor—a much more serious matter to speculators—the flotation of any subsidiaries. The future for this company is problematical, and the shares are a doubtful speculation.

Vogelstruis.

Vogelstruis Estate.—Four years ago, when the battery of this mine was shut down, it was assumed that the working of the unoxidised ore developed would not leave a profit. Since that time working costs have become less, and a slight improvement in the value of the ore at the bottom of the mine is noticeable. The shareholders have raised £100,000 on debentures, which money is being devoted to further development of the mine, and to the erection of necessary plant. It is now thought that the company may be able to make small profits.

Kimberley Roodepoort.

Roodepoort.—This mine has a large claim area, but the ore is low grade. So far, the mine has never earned regular profits. I am of opinion, however, as in the case of the Unified, that if the debt were paid off, the mine developed for a year ahead, and a new mill and sorting-tables erected, the mine would pay. To this extent I consider shareholders would be justified in raising £150,000, but the control of the mine should be in more energetic hands than it has hitherto been.



A CYANIDE PLANT ON THE RAND.

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French Rand.

French Rand.—The French Rand is usually spoken of as a deep level. As a matter of fact the principal workings, and the richest ore, found *are* on the dip of the Champ d'Or, but the company also owns a lot of outcrop ground. In all there are 400 reef-bearing claims, but it is doubtful whether more than one-half of these will be found to carry payable ore. There are now 250,000 tons developed, which will give an average yield of 38s. per ton, leaving 10s. profit. It is intended to increase the battery to 120 heads, for which purpose a total debt will be incurred, including the present debenture issue, of £270,000. Even with 120 stamps at work, assuming the present defective labour supply can be overcome, profits will hardly be such as to warrant investors buying the shares at £2.

Champ d'Or.

Champ d'Or.—The life of this mine should be nearly 4½ years, and the average dividend 50 per cent. This makes the shares worth £2¼.

Windsor.

Windsor.—This mine has turned out unexpectedly successful, but not enough is yet known of it in depth to warrant the shares being classed as a sound investment.

Eton.—This lately floated mine—part of Luipaard's Vlei—will be amalgamated with the Windsor.

Luipaard's Vlei.

Luipaard's Vlei.—An estate, bringing in a revenue of £8,000 a year from claim licenses, and an immense number of reef claims, carrying particularly low grade ore, are the company's assets.

This is an oft reconstructed property. It has now developed its eastern claims and floated these off into the Eton mine, which in turn will amalgamate with the Windsor. The rest of the big Luipaard's Vlei area is low grade. Its payability is doubtful.

York.

York.—Apparently the York mine has a life of from seven to eight years only, and, as its profit-earning capacity is small, it is doubtful whether it will pay off the par value of the shares.

West Rand Mines.—The small scale of operations here is out of proportion to the big area of ground owned. Already, however, there is a debt of £60,000, and at least £100,000 in addition is necessary to put the mine on a solid basis. Eventually, patches of payable ore should be found, but the company is over-capitalised already, and by the time it has suffered reconstruction, present shareholders will find that their original shares have cost them a price which it will be difficult to recover. The present shares are a fair speculation. West Rand.

West Rand Central.—A small, London controlled mine, which is not likely to pay much more than working expenses. There are twenty-nine claims. West Rand Central.

Randfontein Subsidiaries.—This group of mines, the most westerly of any on the Main Reef series, I deal with under one head. It is the boast of those who control these mines that all information about them is withheld from the public. The public, to show its appreciation, eagerly buys Randfonteins and Randfontein subsidiaries on the first sign of a rising market. Randfontein Subsidiaries.

Of the subsidiaries, **Porges Randfontein** pays an occasional dividend of 10 per cent.—averaging rather less than one a year. The company owns 200,000 South Randfontein shares. Porges.

South Randfontein.—Recently commenced to crush, and has paid one 10 per cent. dividend. It appears to contain good ore, and is well thought of. South.

North Randfontein.—After working for several years at a loss is now shut down. North.

Robinson Randfontein is working without profit. The company holds 400,000 Block A shares. Robinson.

Mynpacht Randfontein, and Block A Randfontein.—Floated several years ago, have not yet reached a producing stage, and both at present are shut down. Mynpacht. Block A.

All these mines own large claim areas, but are ov capitalised : poorly equipped : do not practise ore-sorting : and can be easily seen, have not proved in the aggregate successfu

Six more subsidiaries were floated just before the war. This I believe, was done to evade a certain alteration in the gol law which was about to come into force. I cannot ascertain that these mines have any working capital to speak of, so consider that they are not worth discussing. A new reef on Randfontein. Recently a new reef was found on Randfontein which, it is assumed, traverses all the mines. It is reported that this reef is of good value, and that the prospects of all the mines are improved thereby ; but I believe I am right in stating that this reef, although good in places, is not consistently payable, and that not nearly enough work has been done on it to warrant exaggerated ideas as to its value.

On the whole, probably, the new reef will be found to be an asset of value to a certain extent, but the general condition of the Randfontein mines is not yet such as to make the shares worth buying.

Beyond this, to the west, the main reef series becomes quite unpayable, and is soon lost sight of.

Deep levels : their inception.

When the Witwatersrand banket beds were discovered, in 1885, expert opinion varied as to a diagnosis of their nature. After 1890, however, it gradually became apparent that these reefs had been laid down by the action of water ; that the gold contents were distributed with unusual regularity ; and that they were likely to extend to a great depth. Then, as the reefs of the series dipped towards the south, it was at once evident that all ground lying to the south, which except for the first thousand feet or so, had been reckoned as worthless, was in all probability underlaid by the reef, and therefore of great prospective value. Most of the mines then in existence had only secured about 1,000 feet of ground on the dip of the reef, and all ground beyond that, henceforth known as deep-level areas, was at once snapped up by capitalists, proprietary syndicates, and such of the outcrop mines as had time to grasp the future possibilities of such areas.

Geological.

A banket reef or bed is a conglomerate of waterworn white quartz pebbles, cemented together by a mixture of silica, sand, and iron pyrites, and it is in the cement—not in the quartz pebbles—that the specks of gold, although seldom visible to the naked eye, are found. This conglomerate was originally laid down on the bottom, or perhaps on the sloping beach, of a great inland sea. The white pebbles were probably the remains of earlier quartz reefs which had been broken into fragments and finally became waterworn. In course of time the detritus being washed into this particular sea ceased to contain quartz fragments, so that another layer, containing no quartz, was deposited on the top of the pebble bed. In the course of ages by the deposition of layer upon layer of sand, the pebble bed is found to be lying several thousand feet below the bottom of the sea, cemented into a compact mass by pressure from above. In the course of time, the sea, having fulfilled its particular destiny, flowed elsewhere. As to the final geologic process, science is at present in the dark. How has the edge of the pebble bed been again brought to the surface? Was the bed originally the bottom of the sea, and has it been tilted up by a great convulsion of the earth, or was it originally the beach of the sea, and at present lying not much out of its original position? The question is deeply interesting; but the fact remains that, in 1885, the edge was found sticking out at the surface, and since then mining operations and boreholes have proved that the bed at least extends, without any real break, to a vertical depth of nearly 5,000 feet, and that its slope, excepting near the surface, is wonderfully regular.

Geologists, as on most other questions of a similar kind, still differ as to how the gold came into the reefs. It was once thought that the countless specks of gold were deposited in the beds at the time the beds were formed, and that their regularity over this great area—unlike anything else in the world of mining—was due to the action of the water. But the more generally accepted theory now is that the beds, when formed, had no gold in them—or very little—and that the gold was subsequently deposited from mineral solutions percolating these beds.

Experts' opinions and deep levels.

But all these facts, especially the proving of the reef to great depths, were only gradually brought out.

It must be borne in mind that, since the discovery of the Rand, and particularly as regards the question of deep levels, gold mining knowledge has had to be largely readjusted. The previous history of deep gold mining consisted almost entirely of quartz veins, which originally in molten masses had filled the cracks and fissures in the solid rocks.

In reefs of such nature it is usual to have small rich patches, in which the concentrated gold, or gold originally held in solution, has settled, and for the remainder of the mass to be worthless. With reefs of such a treacherous nature, to sink a shaft of 1,000 or 2,000 feet on chance would have been a dangerous experiment, so that deep-level mining, up to the days of the Rand, was a thing almost unknown.

Although, speaking generally, the gold contents of the whole banket bed were supposed to be distributed with comparative regularity, it was surmised, and correctly so, that the deep-level areas directly below the richest outcrop mines would be richer than those beneath the poorer outcrop mines. It also applied that, where the outcrop mine was little disturbed by faults and dykes, the deep level of the same mine would also probably be comparatively free from such disturbances. With these points in view, the earliest deep-level mines floated were those directly underneath the richest and least disturbed outcrop mines.

Rand Mines, Ltd.

In 1892, a deep-level proprietary company was floated, the Rand Mines, Limited. It held 1,800 claims, selected with great forethought directly beneath all the richest and least broken outcrop mines. Several boreholes were sunk, notably on the dip of the Geldenhuis and Crown Reef mines, cutting the reef exactly where predicted, and half-a-dozen subsidiary deep-level mines, each with from 150 to 200 claims, and each with several hundred thousand pounds working capital, were floated. By this time all the deep-level area on the Rand

Boreholes.

which was thought to contain the reef even at the extreme depth at which mining could be carried on, was pegged out, and claims in favourable and unfavourable localities were bought and sold for thousands of pounds each. Boreholes were sunk outside of the central and richest portion of the Main Reef, cutting the lode in almost every case, and further companies were floated and financed in the same lavish manner.

In 1893, by far the deepest borehole yet sunk struck the reef a long distance below the then boundary of the Simmer and Jack mine, at a depth of 2,385 feet. As the engineers of most of the already floated deep-level mines estimated that the reef would run out of their ground at a depth of not more than 2,000 feet, it at once became evident that a second row of deep-level mines could be formed to work the still deeper areas, which, owing to the flattening somewhat of the banket bed, still lay within a practical mining depth. To this end the Gold Fields Deep Proprietary Company was formed, and its financing was guaranteed by the Consolidated Gold Fields of South Africa, Limited. As if to justify this further great undertaking, which involved the sinking of millions of capital, the reef was again struck, in 1895, on the dip of the Meyer and Charlton mine, in the centre of the Rand, at a depth of 3,251 feet.

Second r

Goldfiel
S.A.

This was known as the 'Bezuidenville' borehole, and the spot is now included in the ground of the South City, Ltd. It proved the reef certainly, but it was hungry-looking and very poor.

Since the war, all these records have been broken by the 'Turf Club' borehole.

This cut the several reefs of the series at about 4,800 feet.

The average value of the two reefs was nine dwts. for a width of forty-four inches.

Here again, at a great depth, is the reef, but again poor.

Problems
deep-leve
mining.

It was soon discovered, as the deep-level working proceeded, that the natural conditions for deep-level mining on the Rand were favourable. There are four drawbacks to deep-level mining. These are:—

(1) Loss of value in the ore. (2) Broken ground.
(3) Water. (4) Heat.

Value of ore in depth.

Owing (1) to the water-laid origin of the reef, and the regular deposition of the gold wherever yet found, it seemed probable that the gold contents would not become poorer in depth. In the aggregate this theory has proved correct. Particular areas of deep-level ground have proved unexpectedly poor; other areas, however, have proved to be good; but the average deep-level ground to the depth yet explored has proved to be about equal to the average outcrop ground.

Broken ground.

With regard (2) to broken ground, such exists in all mines, and few mines on the Rand are free from faults; but, on the whole, the faults in the deep levels, although more frequent than in the outcrop mines, have been found to be easily traced, and are not reckoned as a serious factor. The rock formation (3) is so close that a comparatively small amount of water finds its way into the deepest workings when they have once been pumped dry of the water tapped during shaft sinking.

Water.

Temperature.

Finally (4), the increase in temperature is found by experiment to be not more than 1 degree in 200 feet, and there is no reason why the temperature, with a formation of solid sandstone, should debar mining operations at, at least, 6,000 feet.

Experience gained from outcrops.

The experience gained by the working of the outcrop mines is another point which the engineers of the deep-level mines have in their favour. In the outcrop mines millions of pounds have been spent needlessly upon inferior machinery and installations, upon useless shafts, and upon the tracing of lost portions of reef. In the deep-level equipments the most perfect and efficient machinery is used from the commencement, no useless shafts are sunk, and the tracing of faulted patches of reef, with the plans of the outcrop mines as a guide, is a work of comparative simplicity.

Working expenses.

It may indeed be accepted with perfect confidence, that, except at the very deep levels, the working expenses will be no more than those of the outcrop m [illegible] the deeps there will be a rather higher cost for dynamite, owing to the harder nature of the ground; for labour, owing to the flatter reef necessitating more shovelling of the ore; and, for coal, owing to the greater depth from which the ore has to be hoisted; but these are mere fractional increases, and are easily balanced by the economy effected by a finer equipment and a more compactly-planned surface plant.

Unfavourable features.

It is necessary to point out several matters which, to the genuine investor, represent the weak side of the question. As we have seen, the early floated deep levels were specially selected with regard to their proximity to rich and little disturbed outcrop mines. As the demand for shares increased, however, company promoters turned their attention to the deep-level ground of the poorer and more broken mines, with the result that some deep-level mines were floated which should have remained uncapitalised until mining conditions in the Transvaal had improved. There is no doubt that these mines will contain the reef, but it is doubtful at present whether it will pay to work them. These mines will be specified in due course.

Some mines are situated in poor localities,

others are badly cut up by dykes and faults.

Secondly, there is the question of individual mines being badly cut up by faults and dykes. These mines, also, will be specified. As has been stated, the general question of disturbed ground in the deep levels is not a very serious one. On the whole, the disturbances are not more serious than in the outcrop mines, and are more easily traced. It so happens, however, that at from 800 to 1,200 feet deep the banket bed, which near the surface lies at a steep angle, flattens considerably. The result is that at the change of angle there are, in some localities, patches of badly-disturbed reef, and these patches have been encountered by the development work of several of the deep-level mines. As a matter of fact, these disturbances, some time ago, gave rise to anxiety, but subsequent workings prove that as the reef assumes, in depth, its normal angle, the disturbances die out, and the position generally is now much better than it was at that date. The result is, however, that certain mines have had to spend more money in development work, and have been somewhat retarded in reaching a producing stage. Then, again, there is the question of faults or dykes, at present unknown, that may be encountered deeper. This, of course, is a risk connected with all mining, but a special example may here be cited.

Simmer East fault.

Two years ago the Simmer East Company, a second row deep level, sunk a borehole and expected to cut the reef at 2,800 feet. Instead of this, it was found at 1,830 feet, having been thrown up, by a fault, a distance of nearly 1,000 feet. This may turn out eventually to be a fortunate circumstance for the Simmer East Company, and, indeed—should the fault extend laterally—for a number of the second row deep-levels; but at the same time, it shows that serious faults are to be expected even at a great depth, and that the deeper mines will have to carefully locate the reef by boreholes before commencing work. These remarks do not apply so much to the first row deep-levels, in which it is unlikely that there are any big step faults of such a nature.

The financial question.

But the financial question is really the most important affecting the deep levels.

Cost of equipping a first row deep.

To fully equip a *first* row deep level for 200 stamps, and to develop from 500,000 to 1,000,000 tons of ore, costs about £540,000; while the nine first row deeps controlled by the Rand Mines, Limited, spent on an average £500,000 before they commenced to return any profit at all.

A second row.

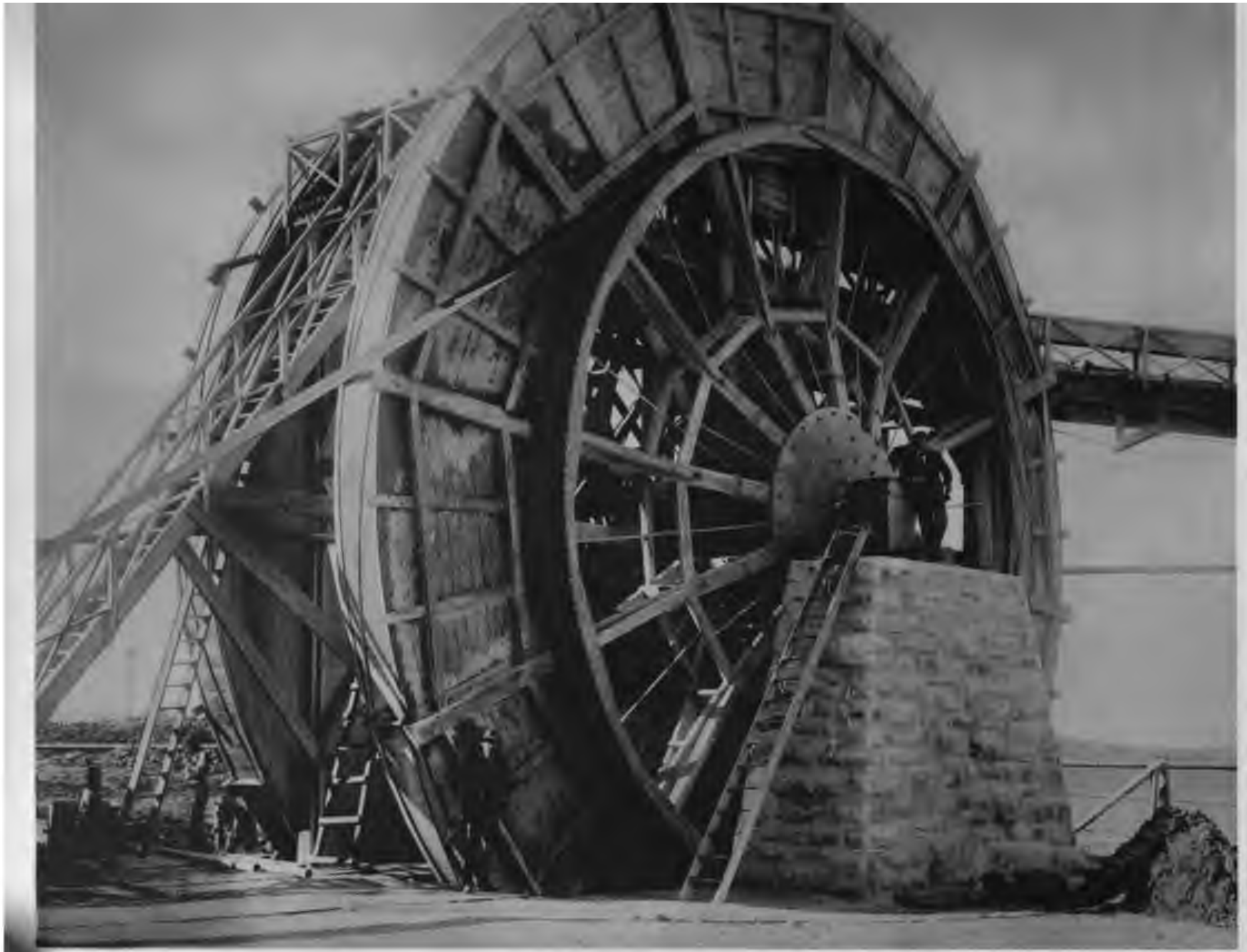
To equip a *second* row deep level for 200 stamps, and to develop from 750,000 to 1,000,000 tons of ore ahead, costs about £650,000. While in addition the working capital paid in will be lying for a longer period without earning interest.

A third row.

To equip a *third* row deep level, in a similar manner, with shafts varying in depth from 4,000 to 5,500 feet, will cost, probably, a minimum of £750,000. No mines in this category, although several have been floated, have yet arrived at such a stage of development that any accurate data as to costs, or as to engineering problems, are possible.

All well-located deeps will be satisfactorily financed.

As regards the question of deep-level finance, I think we may take it that every well-located reasonable mining proposition



TAILINGS WHEEL AT THE ANGELO—DRIEFONTEIN 220 STAMP MILL.

on the Rand—such is the strength of the financial groups behind these concerns—will, in the future, be provided with the necessary cash for its development, from time to time as required.

There are at present 50 deep-level mines on the Rand. Others are being formed.

Of these, 15 have already received all the money which they will require.

Summary of financial position.

Of the remaining 35 mines—which will require additional cash to the extent of about £13,000,000—24 will, in all probability, be satisfactorily financed during this year.

The remaining 11 mines will probably be furnished—from time to time—with enough cash to cut the reef and do some development work, but most of these mines are in bad localities, and may never arrive at a producing stage.

The following account of the individual deep levels contains practically all the facts about these mines that appeal most strongly to investors.

The summary is prefaced by a table of these companies, giving the following particulars:—

(*a.*) Control. (*b.*) Issued capital.
(*c.*) Debt. (*d.*) Further cash required.
(*e.*) Remarks as to the financial position.

MINES SITUATED ON THE MAIN REEF SERIES.—DEEP LEVEL MINES.

Statement as to the Financial Position before the War.

	Name of Mine.	Issued Capital (£1 Shares)	Debt and Debentures	Further Cash Required.	Remarks as to the Financial Position.
		£	£	£	
A	Geldenhuis Deep ...	300,000	128,000	—	**Debentures Redeemable by Annual Drawings.**
	Crown Deep	300,000	—	—	
	Rose Deep	425,000	—	—	
	Glen Deep	600,000	—	—	
	Jumpers Deep... ...	523,895	—	—	
	Langlaagte Deep ...	650,000	500,000	—	**Will Issue Reserve Shares to Liquidate Debt.**
	Nourse Deep	450,000	—	—	
	Durban Ro'depo'rt Deep	300,000	200,000	—	**Option on Reserve Shares to Redeem Debentures.**
	Ferreira Deep	900,000	—	—	
	South Rand	300,000	—	650,000	
	South Nourse	540,000	—	100,000	
	Robinson Central ...	400,000	—	150,000	
	Village Main Reef ...	400,000	—	—	
	Village Deep	377,542	—	500,000	**Will Issue Reserve Shares at £5 to meet eventual Debt.**
	Bonanza	200,000	—	—	
	Angelo Deep	435,000	—	450,000	
	West Roodepoort Deep	227,200	—	200,000	
	City Deep	450,000	—	300,000	
	South City	460,346	—	320,000	
	Suburban Deep ...	375,000	—	500,000	
	Wolhuter Deep ...	392,500	—	270,000	
	South Wolhuter ...	450,000	—	400,000	
	Klip Deep	375,000	—	450,000	
	Witwatersrand Deep ...	351,900	200,000	200,000	**Option on Reserve Shares to Redeem Debentures.**
	Knight Central ...	412,739	—	450,000	
	Driefontein Deep ...	381,000	—	400,000	
	Vogelstruis Deep ...	330,000	120,000	250,000	**Option on Reserve Shares to Redeem Debentures.**
B	Robinson Deep ...	450,000	—	—	
	Simmer and Jack East	600,000	500,000	—	**Option on Reserve Shares to Redeem Debentures.**
	Simmer and Jack West	300,000	—	500,000	
	South Rose Deep ...	429,300	—	400,000	
	South Geldenhuis Deep	322,000	—	400,000	
	Rand Victoria	630,000	—	—	
	Rand Victoria East ...	375,000	—	450,000	
	Knight's Deep... ...	443,093	400,000	—	**Option on Reserve Shares to Redeem Debentures.**
	Jupiter	467,200	400,000	—	**Do. do. do. do. do.**
C	Cinderella Deep ...	500,000	—	250,000	
	Steyn Estate	300,000	—	400,000	
	Roodepoort Central ...	220,000	150,000	100,000	**Option on Reserve Shares to Redeem Debentures.**
	South Village Deep ...	593,334	—	700,000	
	Bantjes Deep	400,000	—	650,000	
	South Randfont'in Deep	225,000	—	500,000	
	South-East Rand Deep	200,000	—	—	
	Kleinfontein Central ...	225,000	—	500,000	
	Chimes Mines... ...	325,000	—	600,000	
	Langla'gte [illegible] Deep	75,000	—	300,000	
	East R[illegible]eep	170,000	12,000	250,000	
	Tudo[illegible]	340,000	—	250,000	
	Wel[illegible]	50,000	—	?	
	Ge[illegible]	[illegible]76	—	?	

Geldenhuis Deep.—Area, 185 unworked claims on the dip of the Geldenhuis Estate. Commenced crushing in 1895 with 100 stamps. The stamping capacity was gradually increased until the whole 200 stamps were at work, and for two years now the profits earned have been exceptionally high. Geldenhuis Deep.

In 1898, the company paid 75 per cent. dividend, and, but for the war, possibly 100 per cent. might have been paid for 1899. As there are a million tons of ore in sight, of the present average value, it is safe to assume that a dividend of about 100 per cent. may be expected with regularity. Owing to the large reef, an additional 60 stamps may be erected shortly, which would add value to the shares.

The life of the mine, with 200 stamps, will be about twenty years more, and, on a 7 per cent. basis, the shares are worth £10.

Crown Deep.—Area, 155 unworked claims, the deep level of Crown Reef and Bonanza. The capacity is now 200 stamps, at which figure it is likely to remain. There are about 800,000 tons of ore developed. So far as is known, this will yield about 40s. per ton. The estimated average of the mine, at an earlier stage, was from 45s. to 48s. per ton, and to this extent, that is to say, of earning from 5s. to 8s. per ton less than was expected, the mine has proved disappointing. But even as it is, a profit of almost £1 per ton can be relied on—from ore in sight—for years to come, and the mine on this basis is one of the best on the Witwatersrand. A better average value may be found when the eastern workings of the mine open up the rich ore coming from the Bonanza and Robinson—this, indeed, is probable. The mine is badly cut up by dykes, which do not interfere with the actual existence of the reef, but add to the cost of development. The life may be placed at eighteen-and-a-half years more. Crown Dee

The company holds 113,384 Robinson Central Deep shares; including these shares, the value of Crown Deep is about £13 5s.

Rose Deep.—Area, 170 unworked claims on the dip of the New Primrose. The ore developed is nearly one million tons; Rose Deep.

this is being crushed by 200 stamps, and owing to the unusual width of the reefs, 60 more may be put up. The mine is cut into two portions by a big dyke, several hundred feet wide, but as the ore below the dyke is of high grade, and as the dyke itself has caused a valuable overlap of reef, the mine has not suffered severely from its presence.

The results from this mine to date have been wonderfully good, and to all appearance they will continue equally so. The area of the company seems to cover a large patch of particularly thick ore.

A regular dividend of 80 per cent. should be quite possible, with the certainty of increasing this to 100 per cent. when the other stamps are put up. The life of the mine, with 200 stamps, is twenty-four years more, and, on a 7 per cent. basis, the shares are worth £10¾.

Glen Deep

Glen Deep.—Area, 182 claims, the deep level of the Glencairn and May Consolidated. The present 100 stamps will be increased to, probably, 200 in the course of a year or so. The first developments in this mine showed broken ground and reef of rather low value, but since then a change has taken place, and the mine is now considered as certain to have a big future.

Apparently, the Glen Deep lies in the centre of a large area of good ore, which, till a year ago, was not looked for in this particular locality. As it is, the lowest workings in the Primrose, May Consolidated, Glencairn, and Knight's outcrop mines all show good ore, and this extends down to the Rose Deep, Glen Deep, and Knight's Deep, showing even a better average in the deeps than in the outcrops.

A comparatively big area of the Glen Deep is taken up by two large dykes which pass through the mine. These do not dislocate the reefs seriously, but they cause a big blank where reef should be, and this shortens the estimated life of the mine. It is difficult to accurately estimate the value of the shares. With 200 stamps at work, however, they should have an intrinsic value of £5.

Jumpers Deep.—Eventually, 200 stamps will be worked on this mine. The company owns 250 unworked ore claims, and has arranged to buy from the Jumpers Company, should that company be in a position to sell with a clear title, its twenty-eight bewaarplaatsen claims, for 36,662 shares. Jumpers Deep.

The Jumpers Deep holds an asset of 44,828 Jupiter shares.

There are 600,000 tons of ore developed, all of which is estimated to yield 40s. per ton. The reefs are narrow on the whole, but the mine is a sound one, and the results to date, with 100 stamps, have proved satisfactory.

The eventual capital will amount to about £570,000: 200 stamps should yield a profit of £200,000 a year, and on this basis the shares would be worth about £5.

Langlaagte Deep.—Area, 184 claims on dip of Langlaagte Estate and Langlaagte Royal. For a long period after the reefs were struck in this mine the ore exposed gave disappointing assays. For the last year, however, a better average has been exposed, and the 800,000 tons developed may be expected to yield a return of from 28s. to 30s. The value of the shares is difficult to gauge, but it is not so much as the present market value. Langlaagte Deep.

Nourse Deep.—Area, 196 unworked claims. This has been, on the whole, a disappointing mine. From its location—the dip of the rich Henry Nourse—it was expected to yield fully 60s. to the ton. When the reefs were developed, however, it was found that the mine was not only badly cut up by dykes and faults, but that the ore was of a lower value than that in the outcrop mine. The broken character of the ground is due to the formation—which from the surface to a vertical depth of 1,000 feet, lies at a steep angle—suddenly flattening. Below this line of disturbance there is a slight improvement all through the mine, but the ground is still badly faulted, and the average reef values do not come up to expectations. With an eventual 200 stamps, a yield of 36s. per ton might be possible, but it will be some time before the mine is sufficiently developed for this capacity. Nourse Dee

There are 450,000 tons of ore now in sight.

The company owns 127,332 shares in the South Nourse, with a contingent liability on these of £127,332.

The exact value of Nourse Deep shares cannot be gauged for, I should think, at least two years to come.

Durban Roodepoort Deep.

Durban Roodepoort Deep.—Area, 225 unworked claims. This is a good mine with, however, limited capacities. There is at present only one reef worked, the South Reef, and the actual width of this is only an inch or two. As about 90 per cent. of waste rock has to be blasted down in mining the reef, it is essential that the ore should be most carefully sorted on the surface. This is being done, but, of course, working expenses appear correspondingly high. Owing to there being only one payable reef, and to the fact that it is extremely narrow, the mine, although it has a large claim area, will never be likely to support more than 100 stamps. At present there are sixty stamps, which will doubtless be increased. With 100 stamps, about 25 per cent. of the Main Reef ore, in addition to the South Reef, might be worked at a profit. This would give the mine a life of twenty-six years, a dividend of 25 per cent., and the value of the shares would be £2$\frac{7}{8}$.

Ferreira Deep.

Ferreira Deep.—Area, 142 claims. The claims now belonging to this company were subject for years to a series of lawsuits before they were finally given a clear title. Hence the delay in opening out what used to be estimated as likely to prove the richest area on the Main Reef. Actual development has now proved this estimate to be correct, as the ore opened up to date is of high value. A profit of 50s. per ton is expected, and should the mine eventually be able to run 150 stamps, it would yield startling results. The whole area of the Ferreira Deep—a point of importance—has been to a great extent proved by the workings of the Robinson Deep. This is now the most highly-capitalised gold mine in the world. The shares, I think, stand above their intrinsic value.

South Rand.—Area, 223 claims on dip of Crown Deep and Langlaagte Deep. This company was put on a capitalised basis five or six years ago, but no work has yet been done. The company recently acquired the thirty-eight deep level claims of the Pioneer, and will probably take in the eighty-one deep claims belonging to the Crown Reef. During the present year the ground in this neighbourhood will possibly be refloated into two companies, and shaft sinking will be commenced.

South Rand.

The shares have a big speculative value, as the ground is so well situated; but there is no knowledge of what the reefs may be like when cut, and, moreover, the ground is rather badly cut up, at least on the surface, by a big dyke running east and west through it.

Robinson Deep.—In this mine there are about 208 unworked ore claims. The eventual stamping capacity will be 200 head, but the aggregate width of workable reef is not yet known, and it is, therefore, impossible to accurately estimate the life of the mine; probably the figure will be about twenty years. The property, in which about 300,000 tons of ore stand developed, promises to have a fine career, but the ore is certainly not so rich as in the Robinson, and is somewhat disturbed by dykes.

Robinson Deep.

It will be impossible, until the 200 stamps have run for at least a year, to gauge the value of Robinson Deep shares as an investment. I think that at the present price the shares stand too high.

Simmer and Jack West.—The area of the property is 226 claims, on the immediate dip of the Geldenhuis Deep, but 25 of these will be sold to the Rand Mines Deep. The Main Reef series in this section of the Rand is unusually regular, with reefs of large width and good value. It may be inferred that the fine ore bodies now worked in the Geldenhuis and Gelden huis Deep will continue down into the Simmer West; but, on the other hand, there is no *certainty* that such will be the case. The reef, when found, may be broken up, or a poor patch may be encountered. By the time this is in print the reef will, no

Simmer and Jack West.

doubt, have been cut in the deepest shaft. The shares are a speculation, but with chances in their favour. Should the reef turn out well when found in the shaft, the shares would go higher.

immer and ack East.

Simmer and Jack East.—The property consists of 297 claims on the dip of the Rose Deep, and the company holds, in addition, 269,263 shares in the South Rose Deep, received for 162 claims sold to that mine. The reef was cut at under 1,900 feet, nearly 1,000 feet shallower than was estimated. The reason for this is assumed to be an upthrow, caused by a big fault, and the same phenomenon is expected in a number of the second-row deeps in this section of the Rand.

The development of ore in the Simmer East, so far, has proved disappointing; in fact, many of the assays are so low that it has been thought that the wrong reef is being opened out; unfortunately, however, this theory seems to be unwarranted. There is little doubt but that, eventually, the mine will be found payable, but in the meantime there will be a long delay in starting to crush, and a big expenditure on extra development. In addition to this there is the fact that one large patch in the mine, as already proved, is unpayable, a feature which may repeat itself.

Shareholders in this mine should make a point of being well informed as to the results of development from time to time. Meanwhile, the shares are quite speculative.

and ictoria.

Rand Victoria.—This mine was floated in 1896. It has about 700 claims on the dip of the Simmer and Jack: £400,000 in cash: 45,000 shares in the South Geldenhuis Deep: 143,000 in the Rand Victoria East: and will sell about 400 claims for shares in the Rand Mines Deep. As yet, no attempt has been made to start shaft sinking, and it will be at least four years before any returns can come out of the mine. If the shareholder is prepared to lose interest on his money for four or five years: to see his shares go up and down a dozen times in the meanwhile: and, finally, to take the risk of possible disappointment when the reef is struck, I see no reason why he should not invest in Rand Victorias. Personally, the venture does not tempt me.

Rand Vi
East.

Rand Victoria East.—This is a similar undertaking to that just described. There are 273 claims: there is a working capital provided to the extent of £204,000. At £2 per share, the claims only stand at £2,800 each. All this looks well on paper; but, after all, banket mine as it is, the thing is purely speculative: to the speculator it may appeal, but one cannot recommend this sort of venture to the investor.

Jupiter.

Jupiter is the deep level of Jumpers Deep. There are 488 claims, but a large number of these will be made over to the Rand Mines Deep, for shares in that proprietary company. The mine promises to be a success as it is situated in well located ground, but, of course, till the reef is cut, is simply a speculation. The deepest shaft is now down over 3,000 feet; theoretically, the reef should be found at 3,500 feet.

Knight's
Deep.

Knight's Deep.—The area is 185 claims on the dip of the Witwatersrand mine, and it is proposed to erect an eventual stamping capacity of 200 head. This mine is developing well, and had it not been for delay caused by the striking of a heavy stream of water in one of the shafts, there would, by this time, have been a great deal of ore in sight. Apparently there is, so far, good average ore found in the workings from both shafts, which gives promise that the average value all through the mine will be satisfactory. I cannot hazard an estimate of what profits will eventually be earned, but the shares are quite good up to £4.

South G
huis Dee

South Geldenhuis Deep consists of 193 claims on the dip of the Simmer and Jack. The ground is favourably located. It will take about £400,000, in addition to the working capital of £170,000 provided, to completely develop and equip the mine. At £3 per share, adding the extra amount to be spent, the claims are valued at £9,500 each. The reef is expected to be cut at 2,500 feet.

South R
Deep.

South Rose Deep.—Area, 265 claims on the dip of the Rose Deep and Simmer and Jack. When this mine was

[illegible]

[illegible] Company, [illegible]

[illegible] theoretically, to be [illegible] There is, of course, [illegible] developments in the [illegible] high value upon [illegible] There are 186 [illegible] stands at £28,000, [illegible] £14,000 the price [illegible]

A working capital of £190,000 has been provided, and the underwriters have a three years' option on 94,385 reserve shares at £5, which option will doubtless be exercised, and will produce £470,000 or £660,000 in all.

Bonanza.

Bonanza.—There are seven unworked claims. It will take the 50 stamps belonging to the company six or seven years to work out the ore in these: the average dividend over this period should be 120 per cent., and the shares, to yield 7 per cent. and redemption of capital, are worth about £6.

Angelo D

Angelo Deep.—There are 304 claims. Additional working capital must be raised to the extent of £450,000, and, assuming that this is done by issuing more shares at £4, the valuation per claim would stand at £7,200. This is a small figure when compared with the claim valuation of the Angelo itself, or the Driefontein, under which mines the Angelo Deep is situated, but, on the other hand, it is a heavy valuation for ground which, however well located, is as yet unproved.

Witwater
rand Dee

Witwatersrand Deep.—Two years of development work in this mine have exposed little payable ore. Two reefs exist, but, as I have already stated elsewhere, these two reefs may be merely parts of one and the same reef which has been cut in two by a dyke. There have been several payable patches found, so far, on each of these reefs, but the aggregate result is disappointing. These shares are only speculative counters as yet, and, on the results to date, stand at an inflated value. There are 276 claims.

Knight
Central D

Knight Central Deep.—The area of this property is 445 claims, and it is situated on the dip of Knight's Deep. A further sum of £450,000 will be necessary to equip and develop the mine. One of the shafts cut the reef at about 2,000 feet, exposing a lode five feet wide. Developments on this so far—which is as yet only a few hundred feet—shows the reef to be low grade.

West Ro
poort De

West Roodepoort Deep.—This mine is one of the unfortunate deep levels. It is situated on the dip of two mines which are badly disturbed by innumerable small faults, and the same phenomenon is repeated in this mine itself. The reef, as is the case in all mines in this locality, is a mere stringer, one inch thick. In the surrounding mines this one inch of reef is rich enough to allow of the inclusion of twenty-four inches of waste rock, and still leave a payable product, but in the West Roodepoort Deep, so far as developed, the assays apparently do not average more than about 11 dwts. over a twelve-inch section, and as this would be reduced by one-half in actual stoping, the result must be considered unpayable. But there are 245 claims, and much of this area, no doubt, carries a better value of ore. I consider the shareholders would be justified in raising £100,000 to be spent in further development of the mine.

South Nourse.

South Nourse.—Area, 300 claims, on the dip of the Nourse Deep. Working capital provided, £540,000. The shares are quite speculative, as the value of the property cannot be accurately gauged, but the financial position of the company is unusually sound.

City Deep.

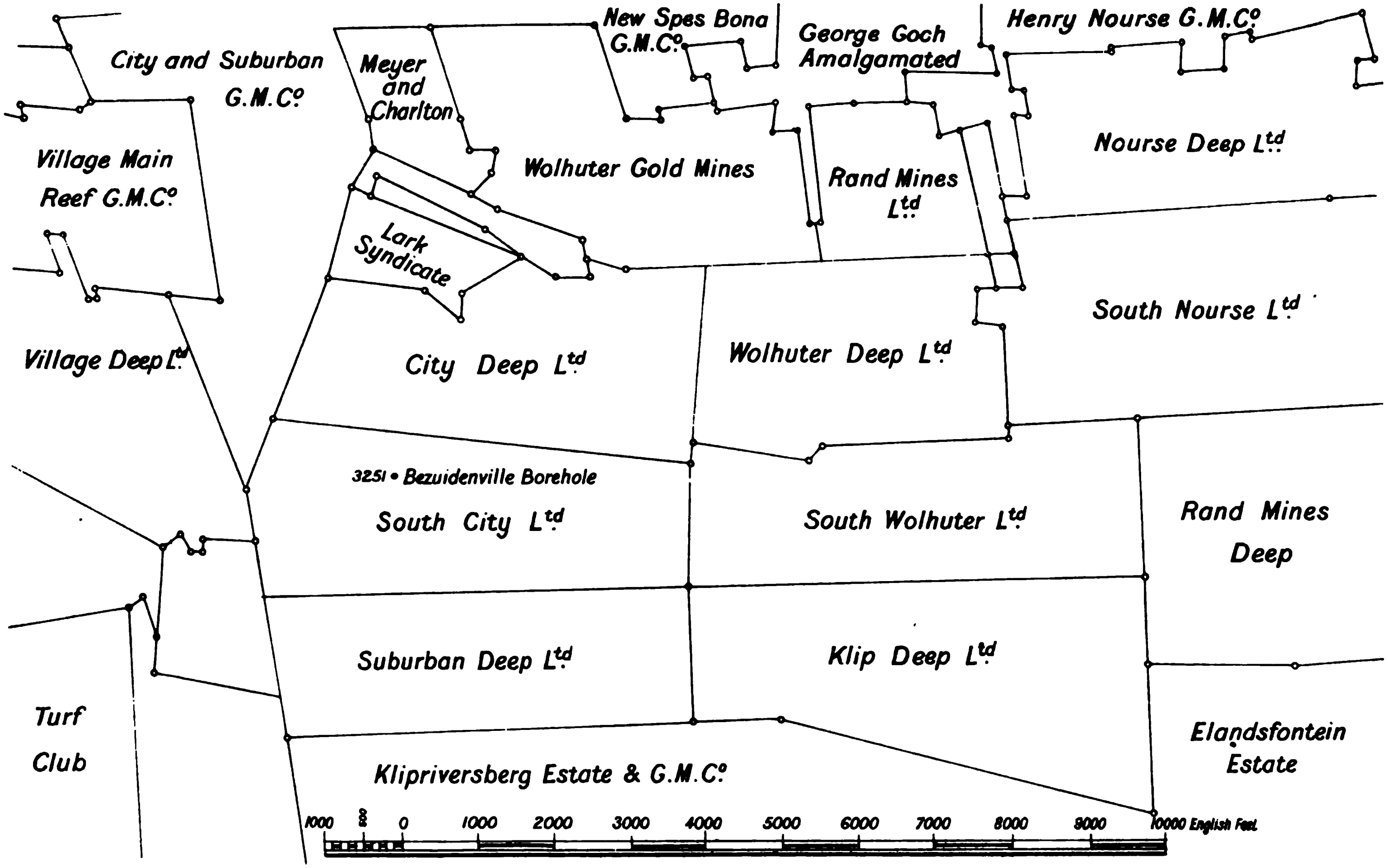
City Deep.—Area, 190 claims, on the first dip of the City and Suburban, Meyer and Charlton, and Wolhuter. Working capital provided £210,000. Further amount necessary £300,000. Claim valuation at underwriting price £6,000. This area is not particularly well located, but the valuation is a legitimate one.

South City.

South City.—Area, 177 claims, on the dip of the City Deep, *i.e.*, on the second dip of the City and Suburban, Meyer and Charlton, and Wolhuter. The working capital provided is about £250,000. At the underwriting price the claims are valued at £5,500 each. Further cash will be required to the extent of £320,000. Near the centre of this property the Bezuidenville borehole cut the reef at 3,251 feet, and showing poor value. The shares are quite speculative

Suburban Deep.

Suburban Deep.—A **South**
City, *i.e.*, the third dip **and**


New Spes Bona G.M.Co
George Goch Amalgamated
Henry Nourse G.M.Co
City and Suburban G.M.Co
Meyer and Charlton
Wolhuter Gold Mines
Rand Mines Ltd
Nourse Deep Ltd
Village Main Reef G.M.Co
Lark Syndicate
South Nourse Ltd
Village Deep Ltd
City Deep Ltd
Wolhuter Deep Ltd
3251 • Bezuidenville Borehole
South City Ltd
South Wolhuter Ltd
Rand Mines Deep
Suburban Deep Ltd
Klip Deep Ltd
Turf Club
Elandsfontein Estate
Klipriversberg Estate & G.M.Co
1000
500
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000 English Feet

Charlton, and Wolhuter. Working capital provided £110,000. Further cash will be required to the extent of £500,000. At the underwriting price of £2 a share, the claim valuation works out at £4,700. The future is doubtful.

Wolhuter Deep.

Wolhuter Deep.—Area, 150 claims, on the dip of the Wolhuter, Spes Bona, and George Goch. Working capital provided £231,250. At the underwriting price of the working capital, viz., £2. 10s. a share, the claim valuation works out at £6,500. Further cash will be required to the extent of £270,000. This is rather a doubtful venture.

South Wolhuter.

South Wolhuter.—Area, 192 claims, on the dip of the Wolhuter Deep, *i.e.*, the second dip of the Wolhuter, Spes Bona, and George Goch. The working capital provided is £175,000. The locality is a doubtful one. The working capital shares are underwritten at £2½, which implies a valuation per claim of nearly £6,000. Further cash to the extent of £400,000 will have to be found. The ground appears to be decidedly over-valued.

Klip Deep

Klip Deep.—Area, 233 claims, on the dip of the South Wolhuter, *i.e.*, the third dip of the Wolhuter, Spes Bona, and George Goch. The working capital provided was £150,000. At the underwriting price of the shares, the area works out at £3,200 per claim. A further sum of £450,000 will be required.

The reef must lie at a depth of 4,500 feet at least. It ought too—from the locality—to be low grade. This is a mine to keep out of.

Driefontein Deep.

Driefontein Deep.—Area, 256 claims, on the dip of the Witwatersrand Deep, and on the second dip of the Western section of the Driefontein. The working capital supplied was £250,000. No work has been done yet, but before the mine is fully developed £400,000 additional cash will have to be raised. The shares, as in the case of many of the deep levels, are pooled and presumably none will be sold under £2. The ground of the company is fairly well located, but the reef probably lies at a depth of 4,000 feet.

Cinderella Deep.

Cinderella Deep.—This company has not commenced work yet, although floated several years ago. The capital has been twice increased. There is now £400,000 cash in hand; this will be insufficient for eventual requirements by £250,000. The reef probably lies at a depth of over 3,000 feet, and, although the ground is in a fair locality, nothing is known of deep ground in this part of the Rand. There are 290 claims.

South East Rand Deep.

South East Rand Deep.—The claim area is 545, but on the extreme dip of the East Rand Extension and Boksburg properties, and as the Main Reef series has never been accurately located in these mines, or, if found in places, has been extremely poor, the property may be considered almost valueless as yet.

Kleinfontein Central.

Kleinfontein Central.—Area, 149 claims, on the immediate deep level of Kleinfontein. The reef in this property is, to a certain extent, proved by the borehole on the Chimes Mines—the deep level of the Kleinfontein Central. In all probability, to judge from developments in Kleinfontein, the reef will be low grade, and shareholders may not feel justified in providing the £450,000 necessary to equip and develop the mine. An amalgamation with Kleinfontein would be the best course, from a mining point of view, and with this in view Kleinfontein Centrals ought to be worth between par and £1½.

The company owns 19,548 Chimes West shares, and £4,700 cash.

Chimes Mines.

Chimes Mines. Area, 510 claims, on the dip of Kleinfontein Central. This company was floated five years ago, but except for the sinking of a borehole, which cut the Main Reef at 1,754 feet, assaying 16 dwts. for 36 inches, no work has yet been done. The company has £30,000 cash, and will require £600,000 more. Bearing in mind that the reef in this locality is low grade, and that the formation will probably be found to be broken, it is doubtful whether the controllers of this mine will ever put up sufficient funds to thoroughly prove it. The shares are a poor speculation.

South Villag Deep.

South Village Deep.—Area, 180 claims, equivalent in their position to the fourth dip of the Wemmer. The reef will not be found at a shallower depth than 6,000 feet, and it will take £1,000,000 to develop and equip the mine. Cash on hand, or at call, £200,000. This is an example of the deep-level flotation we may expect whenever the public gets excited again. The deepest shafts in the world to-day, those at the Calumet and Hecla and Tamarack Copper Mines, in Michigan, have barely reached a depth of 5,000 feet, and yet here we have people calmly floating a property which will require two shafts, each 6,000 feet deep, to work it, and providing not even enough money to sink the shafts—let alone to develop and equip the mine. I cannot see that the shares of such a company have any value.

Bantjes Dee

Bantjes Deep.—Area, 448 claims, on the dip of the Vogelstruis Deep and the Bantjes, the latter a mine that has never yet proved good enough to warrant the erection of a battery. The reef lies at quite 4,000 feet deep, and it would take £800,000 to develop and equip the property. The company was provided with £100,000 working capital. The shares, to my mind, are worth nothing.

Langlaagte Block B Dee

Langlaagte Block B Deep.—Area, 54 claims, on the dip of Langlaagte Block B. This area, low grade as it is, is too small to work as a separate mine, and should be amalgamated with the outcrop mine. It is not certain that the ore will be payable, but the shares have a speculative value of 30s. or so.

Vogelstruis Deep.

Vogelstruis Deep.—Area, 376 claims, on the dip of Vogelstruis Estate. The reef has been cut in two of the three shafts, and is now being developed. It is low grade, but probably certain sections will yield a profit when worked. The shares are still quite speculative, but are not without some intrinsic value. It is as yet too soon for investors to buy the shares. The company owns 11,400 Bantjes.

East Roodepoort Deep.

East Roodepoort Deep.—Area, 161 claims, on the dip of Kimberley Roodepoort. No work has as yet been done here.

The company has £120,000 in cash or at call. The future is doubtful.

Central Roodepoort Deep.

Central Roodepoort Deep.—This mine is turning out well. Its area consists of 190 claims, on the dip of Princess Estate. There is already a large quantity of payable ore in sight, and the company ought to pay regular dividends.

Steyn Estate.

Steyn Estate.—Area, 668 claims, on the second dip of Central and West Roodepoort Deeps. The reef probably lies at 3,500 feet deep, and it would take £700,000 to develop and equip the mine. Towards this there is £300,000 cash in hand. In addition the company owns an estate which yields a revenue of £7,000 a year from claim licenses. No work has yet been done, but boreholes will probably be put down to locate the reef. The shares are entirely speculative, but, owing to the size of the property, they have an attraction for speculators out of proportion to their probable value.

South Randfontein Deep.

South Randfontein Deep.—Area, 119 claims, on the dip of Porges Randfontein, and the block known as Stubbs Randfontein. The mine was floated several years ago with £50,000—less than one-tenth of the amount required—and no work has yet been done. The reef presumably lies at a great depth. Its value is problematical, and the shares are a poor speculation.

Geduld Proprietary.—This company owns the farm Geduld, in the East Rand, and also 2,371 mining claims on it. On this ground three boreholes were sunk, finding the reef in each case. The average depth of the reef was about 1,600 feet. The average size was about 10 inches, and the average value 48 dwts. These are promising results.

This ground is not exactly a new eastern extension of the main reef, but rather the deep level ground of a section already known to contain the reef. In any case it promises to be a discovery of importance. The company will probably float off its ground into six subsidiaries, and remain only as a proprietary company.

Welgedacht.—This is another farm in this same far east area—adjoining Geduld. The reef has not been found here yet. The company owns 1,200 mining claims.

Tudor.—This is a lately floated mine of 261 claims; the location of these is on the dip of part of the French Rand property.

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As a summary to the foregoing description of all the mines on the Witwatersrand, I have compiled a table showing the unworked claims, life, and value of the shares, of thirty of the soundest and most fully-developed mines. The estimate shows what the value of the shares should be, allowing for 7 per cent. interest on the investment, and ultimate redemption of capital.

These thirty mines I have divided into two groups. The first consists of those mines which are not only themselves fully developed, but which are surrounded on three sides by other developed mines. These can be valued with accuracy, both as to their contents and probable profits.

The second group consists of mines which are not so thoroughly proved by adjacent workings, especially by deep levels. These are all sound ventures, but their value cannot be so accurately gauged as the value of the mines in the first group. As an *investment*, they cannot yet be classed with the others. It is only fair, however, to say that these latter mines may possess speculative possibilities which the more fully-proved mines have not got.

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It will be seen from the following table that the public, even on the low basis of 7 per cent. interest, over-values some of these mines, while in many cases there is no margin of speculation left. Investors, apparently, cannot, and will not, make the necessary allowance for the redemption of their capital. For this condition of affairs the financial press, especially the subsidised portion of it, is largely to blame. Were I an investor, ignorant of mining knowledge, the impression I should gain from reading the financial papers of the day would be, that every area of banket is invariable in its characteristics, that every ton of it will yield the exact profits which the controllers of the mine state that it will even for twenty years to come, and that the precise value of the shares, as an investment spread over ten or twenty years, can be ascertained in a moment by a simple rule of three calculation.

Absurd and highly inaccurate estimates of the values of banket mines are frequently circulated.

Absurd statistics of this sort are applied with the greatest impartiality to the very best mines, or to mines which, after ten years' exploitation, are still found to be unpayable.

This wholesale estimating of the values of Rand banket mines—many of which estimates are composed by persons who have never been in Africa—besides being dishonest, is utterly inaccurate. No account is taken of poor patches of ore, although these exist, as we have seen, in at least half-a-dozen mines where least expected: no allowance is made for the damage done, and the loss of ore caused by faults and dykes: no estimate is made of probable higher costs because of lack of native labour, or for stoppages caused by want of water, and yet these are ever present factors. These ideal estimates assume that the mine will produce a maximum theoretical profit every month until it is worked out, and that the shares are worth buying to yield 7 per cent. on this assumed profit without redemption of capital; it is rarely that the life of the mine is taken into consideration at all.

Conditions for valuations vary in every mine.

As a matter of fact, there are no two banket mines in which the same conditions exist, and which are governed by the same factors. It is difficult to accurately value the mines which are fully developed, let alone those which have only been at work for a year or two, and which are little opened up.

The factors from which calculations can be made are continually changing. These changes are usually in favour of investors—but not always.

The most unfavourable factor.

The most serious factor, and one which shareholders must take full account of, is that, where least expected, broken ground, or patches of poor ore, may be found. As present examples, I will mention City and Suburban, Wolhuter, Nourse Deep, South Rose Deep, Simmer East, Knight Central and Witwatersrand Deep. I am afraid that in the great area now being opened up by the deeper deep levels, many of these poor patches will be found, and in the face of such eventualities

I consider the absolute trust shown in the future of all these undertakings is not warranted. No doubt, as a whole, the deep levels will prove highly successful—the first row certainly so—but there are distinct risks to be undertaken before all of these mines shall have been proved payable, and a certain number of comparative failures will surely result.

The most favourable factors.

In the investors' favour we have the following factors :--

Erecting more stamps.

1. The policy of erecting more stamps, whenever the labour supply admits of it, is being generally carried out. By this means the total profits from the mine are returned more quickly to the shareholders, whose investments appreciate in value accordingly.

Working lower grade ore.

2. With larger stamping capacity working costs are lowered. This enables the management to mine at a profit large quantities of low grade ore which would otherwise be left behind as unpayable.

12 cubic feet to a ton—not 13.

3. It has been found, in practice, that 12 cubic feet of ore weigh one ton. All previous calculations of 'lives' allowed for 13 cubic feet, and to this extent the lives of all mines have been underrated by about 8 per cent.

Waste rock and ore-sorting.

4. Calculations of tonnage per claim are either made on clean ore, or on a theoretical stoping width of 36 inches. In actual mining, however, a considerable additional amount of waste rock is blasted down with the ore, and, despite the closest sorting, the tonnage milled always includes more waste than is allowed for in the estimate of ore in sight. This fact adds considerably to the life of the mine, although not to the profits.

Working costs gradually being lowered.

5. Between now and the time when most of the present dividend-paying mines shall have become worked out, further reductions in working costs may be reasonably expected.

Ore reserves are already paid for.

6. Many of the mines have now large reserves of ore developed which have been paid for out of current profits. During the last three or four years of the life of these mines, not only will capital expenditure entirely cease, but these large sums, so locked up, will become available for extra dividends.

Pillars will be worked.

7. When a mine becomes exhausted it will be possible to take out, and at very small cost, most of the ore now left in for pillars and such like. This will mean six or twelve months' work for many of the mines.

It remains to be added that, in the following estimate of lives and values, all these favourable factors have been taken due notice of. The eventual results may, in individual cases, be slightly better than what I have estimated, but I do not think that investors would be justified in assuming that such will really be the case.

TABLE SHOWING THE ESTIMATED INTRINSIC VALUE OF THE SHARES OF THIRTY OF THE MOST FULLY DEVELOPED WITWATERSRAND MINES.

Basis—7% interest on capital invested, plus redemption of capital at 5% compound interest.

These are the safest mines in the world. They are *proved* in all respects.

These are the second best. More development in these mines may result in placing them among the best.

Name of Mine.	Unworked ore claims.	Number of stamps crushing	Estimated life of mine.	Probable average annual dividend.	Estimated value of the Shares.								
					Value on mine dividends.			Value on other assets.			Total value of the shares.		
A				°/o	£	s.	d.	£	s.	d.	£	s.	d.
Bonanza	7	50	7	120	6	0	0		—		6	0	0
Crown Reef	25	120	5	240	9	10	0	6	5	0	15	15	0
Durban Roodepoort ...	45	80	6	125	5	15	0		—		5	15	0
Ferreira	32	80	11	300	21	10	0	5	0	0	26	10	0
Geldenhuis Estate ...	27	120	6½	170	8	5	0		10	0	8	15	0
Heriot	39	70	13	100	8	0	0		—		8	0	0
Henry Nourse	22	80	7	170	8	15	0	1	15	0	10	10	0
Jubilee	6	50	7	100	5	5	0	2	12	6	7	17	6
May Consolidated ...	26½	100	10½	75	5	5	0		—		5	5	0
Primrose	55	160	15	60	5	2	6		—		5	2	6
Robinson (£5)	99	200	14	23	9	10	0		10	0	10	0	0
Salisbury	9½	50	6½	40	2	0	0	1	12	6	3	12	6
Treasury (£4)	22	50	13	18	5	15	0		5	0	6	0	0
Wemmer	24	60	7	190	10	5	0	4	10	0	14	15	0
Worcester	2½	40	3	60	1	12	6	1	15	0	3	7	6
B													
Champ d'Or	6	50	4½	50	2	5	0		—		2	5	0
City and Suburban (£4)	128	160	20	15	6	0	0		7	6	6	7	6
Crown Deep	157	200	18½	120	11	10	0	1	15	0	13	5	0
Durban Deep	227	100	26	25	2	17	6		—		2	17	6
Geldenhuis Deep ...	188	200	20	100	10	0	0		—		10	0	0
Ginsberg...	33½	50	13	35	2	15	0		—		2	15	0
Glencairn	89	160	16	30	2	15	0		—		2	15	0
Jumpers	8	100	4	50	2	0	0	3	0	0	5	0	0
Langlaagte Estate ...	54	200	16	35	3	2	6		10	0	3	12	6
Meyer and Charlton ...	23	80	10	85	5	15	0		15	0	6	10	0
Rose Deep	171	200	24	100	10	15	0		—		10	15	0
Roodepoort U.M. Reef...	82	110	8	60	3	10	0	1	10	0	5	0	0
Simmer and Jack (£5)...	342	320	19	7½	3	15	0	1	15	0	5	10	0
Main Reef ...	131	160	16½	60	5	15	0		15	0	6	10	0
(£4)	136	100	45	10	5	5	0		7	6	5	12	6

Debentur issues.

The debenture issues of Witwatersrand mining companies are nearly all sound investments, and may be recommended with safety.

In nearly every case the debentures carry an option to be converted into shares up till a certain period, and debenture holders already stand to make handsome profits on many of these options.

In fact, as a result of the recent rise in share values, nearly all the options will have been exercised; and most of the debenture issues will be at once cancelled. Already the debenture issues of the Robinson Deep, Angelo, Driefontein, and Van Ryn, have been thus paid off.

It is possible that the invariable success of Rand debenture issues, to date, may lead to the issue of such by mines with less assured futures. The public must take note of this point, but with regard to those already issued there is little risk.

TABLE OF DEBENTURES

Issued by Witwatersrand Mining Companies before the War.

Company.	Amount issued.	Rate of interest.	With option to convert into shares		Redemption.			
					By annual drawings.			Or by payment (after giving six months' notice) at
			at	up to	No. of drawings.	from	at	
	£	%	£					£
Witwatersrand Deep ...	100,000	5½	2½	June, 1900	15	1901	100	105
Do. do. ...	100,000	5½	3	„ 1901	15	1902	100	105
Vogelstruis Deep... ...	122,500	6	1¾	„ 1900	10	1902	100	105
Treasury	54,000	6	—	—	10	1901	103	105
Vogelstruis Estate ...	100,000	6	2	Dec., 1900	—	—	—	—
Glencairn	140,000	6	3½	Feb., 1900	7	1901	102	—
Knight's Deep	400,000	5½	4	June, 1900	15	1902	100	103
Kleinfontein	100,000	6	3	Mar., 1900	8	1902	100	105
Geldenhuis Deep ...	128,000	5½	—	—	8	1899	100	—
Durban Roodepoort Deep	200,000	6	4	Mar., 1900	10	1899	100	105
Simmer and Jack... ...	293,000	5½	—	—	15	1900	100	105
French Rand	200,000	6	2	Dec., 1899	10	1900	100	100
Simmer East	500,000	5½	4	„ 1900	15	1902	100	103
New Comet	175,000	6	3½	Aug., 1900	8	1900	100	105
Lancaster...	180,000	6	3½	Jan., 1902	10	1902	108	—
Consolidated Main Reef...	120,000	6	2½	Dec., 1900	12	1902	103	105
Roodepoort Central Deep	150,000	6	2½	„ 1900	12	1901	110	—
Jupiter	400,000	5½	4	June, 1901	15	1903	100	103
Princess	60,000	6	3	May, 1901	12	1901	108	—
New Chimes	41,000	7	1½	Dec., 1901	4	1902	105	105
Luipaard's Vlei	150,000	5½	1⅛	„ 1901	20	1902	100	103
West Rand Mines ...	160,000	5½	1½	Mar., 1902	20	1904	100	103

Outside districts of the Transvaal.

A distinct line must be drawn by speculators between the Witwatersrand and its mines, and the mines of all the other districts in the Transvaal.

The principal of these districts are Heidelberg, Klerksdorp, De Kaap, Lydenburg, and the Murchison. I have visited all of these, some of them repeatedly, during the last ten years, and have over and over again seen the danger of sinking capital in them.

Heidelberg.

To begin with, we will take Heidelberg.

Since the earliest days of the Rand, when the different series of banket beds there were found dipping to the south, it was known that at Heidelberg, thirty miles distant, there were also banket beds - dipping to the north.

Geologists have assumed, with reason, that these beds form the other side of the great basin which at this particular locality, that is to say, between Johannesburg and Heidelberg, is thirty miles wide, but which is also known to extend 100 miles distant to Klerksdorp, and into the Orange River Colony. The banket beds at Heidelberg are therefore, probably, of the identical Rand formation, but it does not follow — and it is so hard to convince would-be company promoters of this that these reefs, lying on the other side of the basin, carry equal quantities of gold, or lie as regularly as do those on the Witwatersrand.

Periodical [illegible]

A great number of mines have been floated in the Heidelberg district from time to time. Whenever there is anything approaching a 'boom,' a dozen or two dozen mines are floated. Time passes. The mines are found worthless, their money is all spent, and they are shut down. Then they lie idle for years until the next 'boom' comes, when they are [illegible] and refloated, and the same process takes place again. In the 1895 'boom' the Consolidated Gold Fields took extensive interests in the district. Thousands of claims were [illegible]. The Nigel Deep, Nigel Central Deep, [illegible] Nigel were floated, and the district rose in the estimation [illegible] what is the result? The Nigel Central

Deep and Sub-Nigel are shut down, many of the claims are abandoned, and the Nigel Deep, a mine over which hundreds of thousands of pounds have been squandered, has started, after four years, to mill with twenty stamps.

Nigel.

All these years there has only been one good mine in the Heidelberg district—the Nigel mine—and it is on the success of this one small rich patch that dozens of worthless mines have been floated, and hundreds of thousands of pounds lost.

The **Nigel** Company, with an issued capital of £200,000 and £60,000 debentures, was a rich mine in the early days—the richest banket mine in the Transvaal—and during the years 1891-4 did especially well. Then poorer ore was encountered; development fell behind, and for several years the mine remained under a cloud. No dividends were paid, and the shares fell to a low figure. During 1898, however, in several parts of the mine, a large quantity of payable ore was opened out; these chutes have continued to develop well, up to the present, and to-day, it may honestly be said that the Nigel is a better-looking mine that it has been at any time during the last seven years. The management is sound.

Large ore reserves.

There is now a big ore reserve, large profits are assured for some time to come, and the present thirty-stamp mill is being increased to fifty head. It is conceivable that the Nigel will earn a 40 per cent. dividend, from ore already in sight, for some years. The area of the mine is large, the continuance of the rich chutes through the entire depth of the property is now assured by the discoveries in the Nigel Deep, and it is probable that the Nigel will be a steady dividend payer for many years.

But the three or four rich chutes in the Nigel mine, although they probably continue in depth, only occupy a very small area, while for miles around the country is floated off into companies. The Nigel Deep, and perhaps the Nigel Central Deep, will contain any continuation of rich ore found in the Nigel. Below these again, but at a great depth, the rich ore may be found continuing into the farm Grootfontein, which is controlled by the Consolidated Gold Fields.

Poor mines in the Nigel district.

On each side of this good run of ground, which a mass of prospecting and development work during the last twelve years has shown to be the only payable ore in the Heidelberg district, there are a number of mining companies.

On the west there are:—

Sub-Nigel, Ryan, Romola, Florida, North Florida, South Florida.

On the east are:—

East Nigel, Rand Nigel, Transvaal Nigel, Henderson's Nigel, Marievale Nigel, Nigel Extension, Nigel Main Reef, Eastern Main Reef.

In the aggregate a great deal of work has been done by these badly-located mines, but they have, one and all, failed to show themselves payable. Reefs exist in all of these mines, but they are narrow, patchy, and badly-broken.

Some of these have funds in hand.

A number of these mines have a good deal of cash in hand.

Sub-Nigel, with an issued capital of £300,000, has in cash or good assets, about £75,000.

Transvaal Nigel, with £275,000 capital, has £20,000.

Florida, capital, £162,500, has £65,000.

North Florida, capital, £125,000, has £20,000.

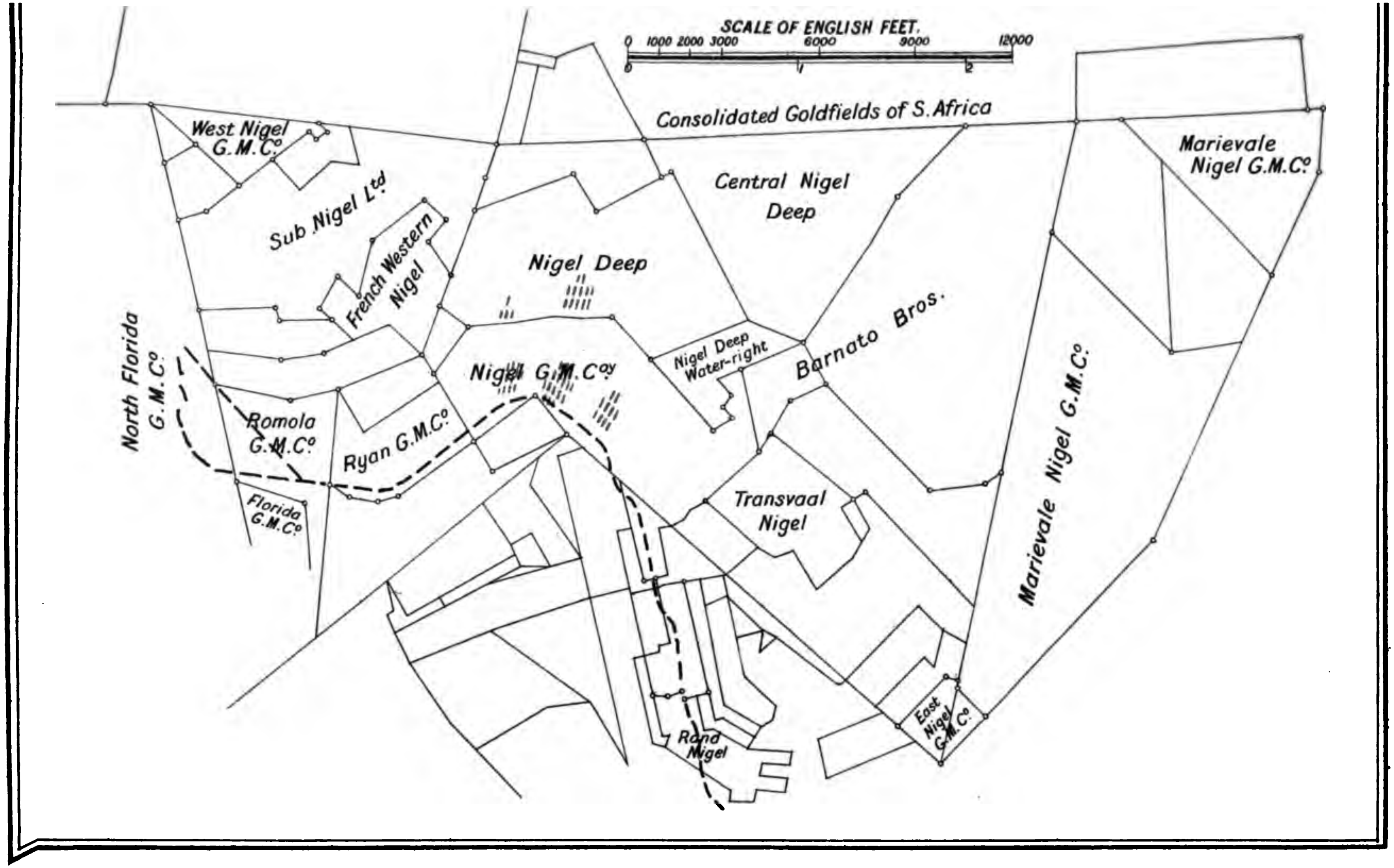
South Florida, capital, £125,000, has £20,000.

We return now to the two mines which may be assumed to contain within their area the continuation of the Nigel chutes—viz., the Nigel Deep and Central Nigel Deep.

Nigel Deep.

Nigel Deep. Issued capital, £450,000.

This property extends to 659 claims, and probably contains within its area the continuation of all the Nigel chutes. But there are also, as development has clearly shown, large areas of poor reef and of broken country, and the sum spent to



NIGEL DISTRICT.

Showing the only chutes of payable ore yet found.

date in developing these barren sections, as compared with that spent in opening out good ore, has been unusually large. On the whole, the ground opened to date in the Nigel Deep, a considerable area, is decidedly not so good as an equal area of the Nigel, and the deep-level mine, even should it improve on its results to date, will never equal the outcrop.

At a recent date there were 102,000 tons of better class ore developed in Nigel Deep. This figure was arrived at by assuming a stoping width of one foot. The value of the ore developed, according to the last report of the Consolidated Gold Fields, was 43 dwts. This, however, was the value of the clean ore, which was only 6·2 inches thick, so that the value of the 102,000 tons is really only about 22 dwts., equal to a recovery value of about 1 oz. The statements contained in the Consolidated Gold Fields report for 1898 that (1) there were 102,000 tons in sight, and (2) that the value of the ore was 43 dwts., were therefore misleading.

The Nigel Deep is a fairly good mine, so far as it is developed, and in a year or two will probably have a lot of payable ore in sight. In the meantime, for a year at least, it will be inexpedient to run more than twenty stamps, and a monthly profit averaging £3,000 is, to my mind, the most that can be expected for some time to come.

Nigel Central Deep.– Issued capital, £200,000. There are 548 claims, on the dip of the Nigel Deep. Several shafts on the property, after being shut down for a year or two, are now being continued. The reef will be cut at about 1,500 feet. It is reasonable to assume that the rich Nigel ore will continue in the direction of the Central Nigel Deep, but the property is in still a speculative stage. There is already a debt of £55,000, and before long the company will have to be reconstructed. Nigel Central Deep.

This completes an account of the Nigel district. Let it be remembered that in all probability there is just one rich patch in the district. This extends from the Nigel, a really good mine, into the Nigel Deep. Here it averages, apparently, a lesser value, but is still good. In depth the same class of ore may be perhaps found in the Nigel Central Deep—but this is purely speculative.

Outside of these properties the shares of all Nigel Mines are simply gambling counters.

Molvneux Mines.

Some distance from the Nigel district is the ground that belonged to the Molyneux Mines. Several years' development of this mine only produced 18,000 tons of payable ore. In addition to this the reef in all the lower workings was much broken up, and a series of boreholes, put down on the dip, failed to discover any reef at all. Notwithstanding these facts, which I gathered from an inspection of the mine, and also from the information placed at my disposal by a late manager of the property, the press and public were deceived by those most interested, and shareholders lost heavily. The company went into liquidation; the ground was bought for a mere nothing, and has now been refloated as the **Nigel Proprietary,** capital, £65,000! On the same line of reef a lot of other mines, equally bad, were floated — **Blinkpoort, Molyneux West, Heidelberg G.M., Heidelberg Estates,** etc. All these mines have been, or ought to be, liquidated.

Heidelberg Roodepoort. Hex River.

In another part of the Heidelberg district are the Heidelberg Roodepoort and Hex River mines.

Heidelberg Roodepoort, after spending £150,000 in a fine equipment, started in 1896 to mill with forty stamps. After working for about a year, at a loss, the mine was shut down. There is a debt of about £80,000. The ore is low grade.

The same remarks as to ore value apply to the **Hex River** and **Boschoek** Mines in this district.

Klerksdorp.

Klerksdorp is about 100 miles south-west of Johannesburg, and lies close to the border of the Orange River Colony. During the exciting days of 1887-90, dozens of mines were floated on the numerous banket reefs that exist here. These all came to grief. The reefs at Klerksdorp, while fairly regular in occurrence, are invariably low grade, yieldi 4 to 7 dwts. It is quite possible that at some distant date these reefs may be worked to pay expenses, but the question is one which need not trouble investors; there could never, to my mind, under any circumstances, be a margin of profit sufficient to attract outside capital.

'Boom' flotations.

In the 'boom' of 1895, all the earlier floated mines, which had been lying for years unworked, were refloated, and a large number of new mines were added to the list. So keen, for example, was the competition to secure ground for flotation in England, that a block of claims that I had held in 1893, and had abandoned after proving their worthlessness by boring, was floated in 1895 for £225,000, as the **Southleigh Mines, Limited.**

'Eastleigh' reef.

On the 'Eastleigh' line of reef, the success of the Eastleigh Mines, which consisted in the fact that the mine was worked for two years without losing money, caused the flotation of the **Eastleigh Deep, Eastleigh Block A, Westleigh, Southleigh, and Ariston.**

Eastleigh Deep, Eastleigh Block A, Westleigh, Southleigh, Ariston.

It may be news to the directors of such of these companies as have not yet gone into liquidation, to learn that, at a certain depth, the 'Eastleigh' reef, which near the outcrop is a well-defined banket body, becomes a large mass of almost 'bastard' reef matter, carrying pebbles only here and there, and worth less than 2 dwts.

This fact I ascertained in 1893, from boring on the claims now belonging to the Southleigh, and I see the same thing referred to in a clever book on the Klerksdorp district, published about four years ago.

Eastleigh.

The **Eastleigh** has a considerable amount of ore developed which would probably pay for treatment if the mine were equipped with the best machinery. There is only one principal chute of ore, however, and as, at any moment, this may turn, in depth, into bastard reef, there is considerable risk in putting up the £100,000 necessary to pay off the company's debt, and to provide the machinery required.

The other lines of reef, do not, apparently, show this unpleasant feature—that is to say, of a banket reef, well defined at the outcrop, turning into a 'bastard' reef in depth. But they are invariably low grade and have never yielded profits.

Klerksdorp G. M.

The **Klerksdorp Gold and Diamond Mining Company** is periodically reconstructed, and is, apparently, always on the point of starting a dry crushing process which is to be a great success. I should be surprised if this mine worked at a profit for six months consecutively.

Afrikander.

The **Afrikander** is a property which infatuated shareholders in England will not consider as unpayable. As a matter of fact a careful inspection of the mine showed me that there was a chute of fairly good ore, about 300 feet long, but all the rest is low grade. This chute is only big enough to yield profits on a very small capital—besides there is no guarantee that the chute will continue in depth. These are poor assets on which to buy shares.

Next to this is the **Afrikander Deep.**

Niekerk.

Niekerk.—As this mine appeared, from assays frequently published, to be opening out so well, it is curious that the directors should have turned their energies, and what is much more important, the company's cash, to the acquisition of a block of claims on the Main Reef at Johannesburg. The Klerksdorp mine is now being developed. Most of the good ore seems to be found in one chute, which is 220 feet long. If the directors really believe in the mine, and wish the public to do so too, they should get a first-class engineer to report on it. That is the best advertisement it could have.

Klerksdorp Proprietary, Southern Klerksdorp, Rietkuil, Wolverand, Palmietfontein.

Klerksdorp Proprietary, Klerksdorp Exploration, Elandslaagte, Rietkuil—all come under the usual Klerksdorp category of low grade properties. There is no reason to think that these mines are payable.

Buffelsdoc A, Buffels doorn Cen Buffelsdoc Consolida

In the Buffelsdoorn district, the Buffelsdoorn mine itself is still at work, but the **Buffelsdoorn A, Buffelsdoorn Central, Buffelsdoorn Consolidated,** and **Buffelsdoorn United,** having failed to find any payable ore, are shut down.

Buffelsdoc

Buffelsdoorn, with an issued capital of £550,000, and a debt of £350,000, has been one of the notorious mines of the Transvaal. With its enormous debt, combined with the fact that the most strenuous efforts of the management only suffice to earn enough profit monthly to pay interest due, there is little hope that present shareholders will ever get anything out of the mine.

Potchefstr district.

In the Potchefstroom district, adjoining Klerksdorp, there are one or two unimportant mines, now shut down. These are **Potchefstroom Exploration, Amazon, Rooderand,** and **Buffels Kloof.**

Rooderan

Rooderand is situated in the Orange River Colony; it possesses a large area, £50,000 in cash, and numerous reefs which are unpayable.

None of the mines in the district are worth attention.

De Kaap district.

The De Kaap district, of which Barberton is the headquarters, lies 200 miles east of the Rand, on the borders of Swazieland.

In 1884-5 the discovery of gold at Moodie's, a mountain range close to the present town of Barberton, brought about a rush from all parts of South Africa to the district. In 1886 the rich patches of ore discovered in the neighbouring mountains, notably at the Sheba, led to the arrival of a number of capitalists from Kimberley—the then financial centre of South Africa—and there was a 'boom.'

Since those days De Kaap has slowly but surely proved itself a failure as a gold field.

Geologica

The reefs, some of quartz, others, such as the Sheba, apparently of quartzite, are entirely different in their nature from those of the Rand. They run through the mountain ranges with wonderful regularity, cropping out here and there in rich patches of gold. These patches rarely continue in depth, and mine after mine has started on such a patch only to shut down finally after a few months' work.

De Kaap is discredited at the Rand. In England, mainly on the success of the Sheba, it has always been held in better esteem, and the 1895 'boom' resulted in the flotation, on previously abandoned ground, of a large number of new companies. Not one of these companies has as yet been a success.

The district a failure.

Of about 30 mines in existence, or recently in existence, at De Kaap, there is only one, the Sheba, which is at all notable. I have no wish to make the position of De Kaap seem worse than it really is. Perhaps the district has never had a fair trial, and even now there may be five or six small mines which may be brought to a regular profit-earning stage; but one must be guided by facts.

It is now fourteen years since the district was opened up. A large amount of capital has been from time to time laid out in all sorts of mining ventures, and the aggregate result has been almost invariable failure.

Sheba.

Sheba.—Issued capital, £1,075,000.

The past history of this mine entitles it to the position of one of the notable gold mines of the world. Briefly described, the mine consists of a wide reef of quartzite, dipping at 45 degrees, and carrying one main chute of rich ore which has been proved to 1,500 feet on the incline. In many places, notably on levels 7, 8 and 9, the chute ore has been of exceptional richness, perhaps averaging 2 ozs. per ton, and of a dimension of 100 feet long, and 60 feet wide. But the chute has been irregular in value, and there is no disguising the fact that all the ore opened up below the 16th level (the shaft is now down to the 19th) has been unpayable.

The value of the ore.

SHEBA MINE.

In the upper levels nearly all of the rich ore has now been worked out. The mill is being increased to 200 stamps, and on this basis there is some years' ore in sight in the mine; but it is low grade now, and probably will not average more than 40s. per ton recovery value. In addition to this I consider that all the rich ore in the Zwartkopje claims has now been worked out, and I look on this particular mine as of no further value. The Oriental and Edwin Bray claims continue to yield a certain amount of payable but low grade ore.

A chute of ore which has continued rich for 1,500 feet in depth, would be expected by many people, even after a temporary falling-off in value, to again become rich at a still greater depth. This view of the case will no doubt be taken by many Sheba shareholders.

A real improvement in the bottom of the mine would be welcomed by mining men all over South Africa, and, of course, would have an important effect on the intrinsic value of the shares.

Taking hard facts into consideration, however, and ignoring problematical discoveries, my opinion is that Sheba shares are not worth par.

United Reef (Sheba).

United Reefs (Sheba).—Generally known as Joe's Luck, said to be improving in depth. I have not inspected the mine. There are fifteen stamps, and a cyanide plant at work.

United Ivy Mine.

The **United Ivy Mine**, on Moodie's Mountain, has, from time to time, paid small dividends under careful management, but these have ceased for some years now. There are two small chutes, on different reefs, which have been followed down a considerable distance. I am afraid there is no reason to think that much improvement can be expected.

Woodbine.

The **Woodbine**, also on Moodie's, is a 'small chute' mine. Recently a large sum was spent in equipping it with a fine plant, and twenty heavy stamps. No good results can be looked for.

Some possibly payable De Kaap mines.

There are a few more mines at De Kaap, and in Swazieland which, so far, cannot be considered to have been proved unpayable. These are :—

Woodstock.
Royal Sheba.
North Sheba.
Colonia.
Shahzada.
Gladys.
Forbes Reef.
Clutha.
Consort.
Moodies Fortuna.
Belfast.
Thistle.
Montrose.
Pigg's Peak.
Sheba Queen.
Albion.
East Sheba.
Cataract.
Great De Kaap.
Central Montrose.

I cannot hold out hopes to the shareholders in any of these mines that they possess anything of particular value.

Lydenburg district.

The Lydenburg district is, on the whole, the most important district in the Transvaal after Witwatersrand.

At Heidelberg, Klerksdorp, and Potchefstroom, there are banket reefs : at De Kaap quartz lodes : while at Lydenburg the reefs are stratified veins, of water formation, entirely different from all the rest.

These reefs, lying nearly flat, run through the mountains, and the outcrop can frequently be attacked from all sides simultaneously. The reefs are usually narrow, and irregular in value; they are difficult to mine, and, on the whole, have proved disappointing.

From 1871 onwards for a number of years, Pilgrim's Rest, the most beautiful spot in the Transvaal, now the centre of reef mining of the Lydenburg district, was a flourishing alluvial field, and supported hundreds of diggers. For some time, however, this industry has practically ceased.

Transvaal Mining Estates.

Since its commencement as a gold field the best mine at Lydenburg, or rather at Pilgrim's Rest, has been the Transvaal Gold, now known as the **Transvaal Mining Estates**. Here a number of reefs are worked. Of these the 'Theta' reef is much the richest, but as this reef is found lying flat on the top of a mountain, containing a limited amount of ore only, and as it has been extensively drawn upon for years, it is being fast worked out. With the working out of the 'Theta' reef, the Transvaal Mining Estates will have used up its most valuable asset. No doubt for years to come the company will continue to make fair profits from its other reefs, some of which are now well developed, but considering the very large capital—£604,225—the shares are much over-valued.

Lisbon Berlyn.

Lisbon Berlyn, a concession covering several farms in extent, with its main mine working some seven miles distant from Pilgrim's Rest, is one of the celebrated mines of South Africa. The celebrity it has attained is more due, however, to the extravagance with which it was inaugurated, and to the eccentricities and the amusing stories told about an early manager, than to the company's profits, which up to the present time aggregate considerably less than *nil*.

When I visited the property, the handsome hand-painted toilet sets, of which earlier visitors even now speak enthusiastically, had vanished, but there were still many silent witnesses of the earlier lavishness and extravagance.

Reduced to its present basis, the company crushes at irregular intervals from a flat lying, highly refractory reef, with an occasional monthly profit of a few hundred pounds. The principal, in fact almost the entire extraction, is gained from the tailings. The reef, which has not been developed to any great extent, is of fair value, but owing to its refractory nature only a small extraction is possible. On the whole, the mine may, with advantage, be left alone.

Spitzkop, Graskop, and Graskop Exploring.

At **Spitzkop, Graskop,** and **Graskop Exploring,** mining operations are irregularly carried on with poor results. The formations worked are both alluvial wash and reefs, but no deposits of a permanent value have ever been found.

Barrett's.

At **Barrett's** results from the same sort of deposits have recently been of a fairly regular nature, and several small dividends have been paid. This sort of mine, however, is, at the best, a poor class of investment.

Coetzeestroom.

Near here is the **Coctzeestroom**—a low grade mine now shut down.

Glynn's Lydenberg.

Glynn's Lydenberg is a fairly good mine, with ore opened out for some years to come. The machinery is worked by water power, and as working costs are therefore low, fairly good profits are returned. I believe that the mine has not a long life, and therefore do not care for the shares.

There are several other exploration and mining companies at work in the Lydenburg district. These own large tracts of land, but as yet none of them have found payable reefs. Such are:—**Victory, Lydenburg Gold Farms, New Lydenburg Mineral, Lionsdale, Grootfontein,** etc.

Murchison Range.

The Murchison Range lies in the unhealthy 'low country' in the north-east of the Transvaal. Mining, owing greatly to the deadly fever season which exists during half the year, has languished in the district for years, and the whole Murchison Range is now practically abandoned. To reach this district the Selati Railway was commenced from Komati Poort, but after the earthworks had been completed for about fifty miles, was abandoned in 1895. The prospects of the district do not warrant its completion.

At various times the **Selati,** the **Sutherland Reef,** the **Gravelotte,** the **Free State,** the **Blue Jacket,** the **Zoutpansberg Consolidated,** and other companies have attempted to work the quartz reefs of the district, but always without success. The Murchison Range, however, is not entirely bad. A personal inspection of the district satisfied me that, given a healthy climate, there are numerous small patches which it would pay to erect five-stamp mills to work, and which would yield good profits to small parties of working men. But it will be years before civilisation spreads to the Murchison Range, and in the meantime the malaria rages every season.

Klein Letaba.

At the Klein Letaba, still further to the north-east, some extremely rich patches were found in 1891-3, and the **Birthday,**

Ellerton, Letaba, and **Ella** mines were floated to work them. All of these patches gave out suddenly, once more illustrating the particularly treacherous nature of quartz reefs in the Transvaal, and for years all these mines have been shut down.

The Rand again.

On the Rand itself the mining people know pretty well what is good and what is bad. They will not be caught buying shares in these outside mines.

The coming deep level madness.

But the Rand is going to go mad over deep levels. Already some of the engineers have got out plans for 5,000 and 6,000 feet shafts. At the bottom of these hauling engines will be placed, and long inclines, on the reef itself, will be run down. It is intended to tap and work out to a vertical depth of 8,000 and 10,000 feet big areas by means of these inclines. With due deference to these able engineers, I think such schemes as these will never be put in force. *I do not believe that the ore is payable at 6,000 or 5,000 feet deep, and I am not sure that much is going to be payable below 4,000 !*

Is the ore payable below 4,000 feet?

Evidence is being accumulated which shows that the ore in the deepest mines opened is getting poorer. In the old days experts based their ideas of the future on the out-crops and first-row deeps. These were great mines : the deeps were as good as the out-crops. But now, for the future, we are dealing with the second, third, and fourth row deeps. These mines cover a new horizon—one of which nothing was known till a year or two ago—and this deeper area is now passing from the period of empiricism into that of facts.

The facts, so far, show that the ore in the second-row deeps—roughly speaking the ore below 2,000 feet vertical—is not so good as that in the first-row deeps. Some is quite good, but there are big patches which no amount of sophistry can make payable.

Facts about the second-row deeps : the ore there is poorer than in first-row.

In the Robinson Deep, the best of the second-row mines, [illegible] good ore everywhere, but it is of distinctly lower value in the Robinson.

er East, South Rose Deep, and Knight's Central—

id-row mines where the reefs have been developed—

there is some payable ore, but the most of it already exposed will not pay to work.

I might point, too, to the results of the two deepest bore-holes on the Rand, both of which cut the reef in this horizon of *unknown* ground. In the Bezuidenville hole the reef was hungry in look, and of unpayable value ; while in the Turf Club hole, sunk on the dip of the richest section of the Rand, the assay result of 9 dwts.—when coupled with a depth of 5,000 feet—is not a payable result. But I do not think it fair to use these borehole values to support this argument.

The third-row deeps.

I believe that, on the whole, the second-row deeps will pay, but not at all on the scale of the first row. As to the third-row deeps, I believe that the gradual impoverishment of the ore, except in one or two rich localities, will prevent them being profitable.

Is not this, after all, quite a natural happening? What other reefs in the world's history will have lasted to even half this depth? Only one or two. Already there is ore in sight that it will take 25 or 30 years to work out—ore worth probably £700,000,000!

Is it not reasonable to expect that the reefs will get poorer in depth?

What is the history of all mines? They do not get richer in depth, they get steadily poorer. Where, in the 400 or 500 mines I have inspected in different parts of the world, did I see a reef that I believed would be payable at a vertical depth of 4,000 feet? This is a banket bed certainly, an unique formation for gold, but if the gold was deposited in it from solutions, after these solutions had risen far enough from their source to lose pressure and heat and liberate their metals, why should the area of deposition reach so much deeper than it does in other reefs?

This question affects only the gamblers.

I hope I may be wrong. As a matter of fact the question is one that will only affect the gamblers. The investor will keep to his outcrop and first-row mines. In these there is plenty of money to be made still. But, whether right or wrong, I know that deep level schemes are going to be altogether overdone, in the next year or two, and *someone* will have to lose.

The coming development of the far East Rand.

The development of the Rand far east will attract people too. There may be rather wonderful discoveries here. Geduld, for example—if it floats six subsidiaries, and they all find payable ore—will attract no end of capital to this particular district. Beyond the area of the East Rand Proprietary Co.—the Blue Sky to be accurate—nothing definite is known of the main reef series. Boreholes on the East Rand Extension ground may have located it. Patches of it are apparently met with in Apex; and, after another big gap, it is found in the Kleinfontein-Modderfontein-Van Ryn stretch. Miles further on, again, we hear of payable boreholes on Geduld, and an apparent flattening of the formation. All these big gaps will be greatly speculated on, and, too, all the deep level ground for miles and miles out. If the formation is going to flatten here, people argue, even the ground of all the collieries may in time come in for deep levels. They are therefore buying coal shares—Transvaal Coal Trust, Rand Collieries, Great Eastern, and Daggafontein farm. What between deep-deep levels, and this far eastern part of the Rand, the dreamers are going to be in it up to their necks!

**How peo
are going
lose mone
in the
Transvaal**

Does the average speculator believe what he has just been reading, *i.e.*, that all the outside mining districts of the Transvaal are practically worthless, and that even on the Rand values are mostly too high. If he does not believe this he will assuredly lose his money—because it will be to the interests of all the Company promoters, and all the papers which they subsidise, to pretend that the mineral wealth of the Transvaal is boundless.

I know that there will be a great boom. All the worthless mines of the Rand, Heidelberg, Klerksdorp, Barberton, Lydenburg and the low country, will be refloated; and before two years are over there will be a thousand of these 'wild cats' in existence. Everybody is now going to invest in Transvaal mines. They will not buy the good shares because they cost so much, but will buy precisely this rubbish that is going to be created for them. For every one who has before held shares in the Transvaal, ten will now go in, and when the crash comes, thousands and thousands of people will lose all their money. The day will come when these people will curse the Transvaal, and curse the conditions which made this state of affairs possible!

CHAPTER III.

THE GOLD MINES OF RHODESIA.

Rhodesia.

Annexation of territories by the Chartered Company.

The Chartered Company assumed the government of Mashonaland, at Fort Salisbury, on October 1st, 1890. Some years later, after the first war with the Matabele, Matabeleland was added to the territory. These two countries form Rhodesia.

Present population and output of gold.

In 1890 the white population of Rhodesia was less than 200; to-day it is about 13,000; and the output of gold—which was hardly anything at all before 1899—is now about 16,000 ozs. a month. It will be much more than this in the course of two years. Railways are being built actively, to tap not only the gold mining districts, but also various coalfields; and several hundred mining and exploration companies have been floated, whose shares are being bought and sold—often at a premium.

That is the position to-day. It seems, at the first glance, a good one. But, putting aside platitudes and getting to the real gist of the question, are the mines really turning out well or are they not?

Troubles contended with from the earliest settlement to the present.

The history of Rhodesia for the first eleven years of its existence is a long record of troubles bravely overcome. After the occupation in 1890 there was continual police-work to do; every prospector was a soldier, every soldier a prospector. The reefs prospected in the early days—those in Mashonaland—were mostly failures. Then came the Matabele war in 1893, and the centre of gravity shifted from Salisbury to Buluwayo. The search for payable reefs commenced over again. When some were found in Matabeleland, it was seen that little could be done without a railway, and the nearest connection, at Mafeking, was five hundred miles away over a desert. But this line was commenced. Then came the second Matabele war in 1896. All mining work was stopped. After the war there was famine. The fine herds of cattle were decimated by rinderpest ; the crops were destroyed by locusts. The natives, too, vanished from the mining districts, and there was no labour. Things were at their worst. Then the railway got into Buluwayo from Mafeking, another into Salisbury from the east coast, and the population gathered more rapidly. After a time some of the most advanced mines started to work, and the first regular output of gold was made. Then, in 1899, came the Boer war. Again, nearly all mining work was stopped, and a large part of the population was under arms.

One other enemy has had to be fought all these years—fever. Every summer it disables more or less seriously a great number of people. Sometimes it kills them.

Mining work done to date—

chiefly on ancient workings.

It is wonderful, taking all this into account, how much mining work has really been done. I suppose there are 150 or 200 small mining camps spread out to-day over this great area. In nearly every case the work done has been to continue in depth the ancient workings found in so many places. These are always on gold reefs. During two visits to Matabeleland I inspected nineteen of the principal gold mines, all of which had been located from these ancient workings. In other places virgin coal seams and copper lodes have been found.

Is Rhodesia going to be a successful mining country?

Has all this work—thrown back at least five years by the troubles through which the country has passed—proved that Rhodesia is going to be a successful mining country?

The positio three years ago and to-d

In the first edition of this book the opinion I gave was 'Rhodesia is distinctly promising.' That was three years ago. To-day more work has been done, and more reefs opened. There is not so much to leave to the imagination. In a sense, the country is still promising; but, if asked the definite question, 'Can you, on results of development to date, recommend the purchase of Rhodesian gold shares at present prices?' I would say emphatically 'No.'

Look at this question in the light of hard facts. Three years ago there was a strong market in Rhodesians. Bonsors were £4 ;

Geelongs £5; Anteriors £2; Selukwes £3; West Nicholson £5; Morvens £2; Confidence £1½—and so on. Who is satisfied to-day at having then bought these or other Rhodesian shares? The prices of all these shares fell away seriously. The war was not the reason of this—except to a small extent—but rather the moderate results they showed, combined with the big capitals. For example:—Bonsor, after crushing for a time, had to shut down and develop more ore—the while going into debt. Geelong did the same. Anterior the same. Selukwe—one of the best mines in Rhodesia—has worked for nearly four years without paying a dividend. West Nicholson had been overrated; on re-sampling, the discrepancy was found out. Morven opened out a disappointment, and also the Confidence mine, so much so that it has already been liquidated.

the most promising mines then and now.

The answer will probably be—'Yes, but these were not the really best mines in Rhodesia. Now you have the Ayrshire, Beatrice, Penhalonga, Globe and Phœnix, Surprise, and Sabiwa. These are the mines on which you ought to judge the country.'

The reply, of course, is that even these mines are not yet developed enough to put their status beyond doubt; they form, too, only a small group when compared to the companies already floated that are not in a promising position.

The evils which are going to harm Rhodesia.

The position of Rhodesia on the whole *is* promising. But in the exaggeration of those who control its mines; their wild ideas of intrinsic values; the over-capitalisation of all the companies; the printing of piles of worthless scrip; and the wide-spread efforts now being made to foist this scrip on the public—there lies the rottenness. These things in the long run are going to bring disrepute on Rhodesia, and eventually counterbalance the finest effort at opening a new country that the world has ever seen.

Over capitalisation

How ridiculous it is to see these exploration or mining companies capitalised in the market at £1,000,000, £500,000, or even £100,000! How many of these, on the genuine working of ore, will ever pay off their present price? Not one in a hundred! To date, after three years' work, the Globe and Phœnix is the only mine that has worked at a real profit. The Selukwe has made perhaps a small profit, and paid off its debt; but the Geelong, Bonsor, Dunraven, Anterior, and others, have worked at a loss. And yet these are the pick of the mines yet developed in Matabeleland!

Characteristics of Rhodesian mines—narrow reefs and short ore chutes.

Rhodesia is a country of narrow reefs and short ore chutes. There are only few exceptions to this. A narrow reef in depth, especially in these schistose formations, is liable to give out altogether. But still more, in depth, is a short chute of pay ore liable to give out. It is sheer madness to think that these short ore chutes can continue down for many hundred feet.

A typical Rhodesian mine.

The typical Rhodesian mine is a narrow reef, or perhaps two reefs, with two or three ore chutes which in individual length rarely average 300 feet.

Probable amount of ore in the mine; its value and profits,

We will assume that such a mine has a reef three feet thick, and ore chutes aggregating 600 feet long. For every 100 feet in depth—that is to say, for each level—this mine will yield 12,800 tons of ore. We will allow this an average value of 45s. a ton; and a profit, after allowing for *everything*, of 15s. a ton. Each level will therefore yield not more than £9,600 profit. To work this 10 stamps will be used. It would not be possible to work more on a reef of these dimensions. These will crush the 12,800 tons in a year. Narrow ore chutes such as these would probably last down for not more than 500 feet, so we may assume that there would be five levels, or five years' work in the mine. At a profit of £9,600 for each level, the total profit in the mine will therefore be £48,000.

but totally spoilt by over-capitalisation.

This sum which, after all, is more than most mines ever earn, is just enough to pay off the original expenditure on the mine for development and machinery, and to give a fair mining interest on the outlay. If the capital of the company had been £25,000 the mine would have been a success! But the capital of the company is not £25,000 but £200,000; the shareholders, misled by wilfully exaggerated ideas of the mine's value, have bought their shares from the original promoters at even a premium, and as a final result they barely receive 10 per cent. of their money back in dividends.

Why the typical Rhodesian mine will not be a success.

I call this a typical Rhodesian mine. That is to say, it is typical of the *better class* mine which arrives at the producing stage. Many reefs are being abandoned before this stage is reached. *Their* ore chutes probably die out at a still shallower depth—perhaps they do not even last below the bottoms of the ancient workings. It is no particular discredit to the country that these reefs should go wrong in depth ; do we not see the same thing in every mining country in the world ? As a matter of fact, I believe that there are a great many mines of this sort in Rhodesia, which will give a small profit, swell the output of gold, and do the country good generally. But they won't make money for the shareholders—because they are being so ridiculously over-capitalised. The capital of these mines should be £25,000 or £30,000—not £150,000 or £200,000. But then what would become of the company promoters ? The discredit, as I said, rests less with the country itself than with the London middlemen and boomsters.

Some mining failures to date :

Again let us take facts to prove this point. What has already been the fate of many mines floated in Rhodesia, and thought at one time to be good ? They have not even yielded the moderate profits I have allowed for.

The Confidence mine has already gone into liquidation, and yet at the time I inspected it people were very hopeful about results.

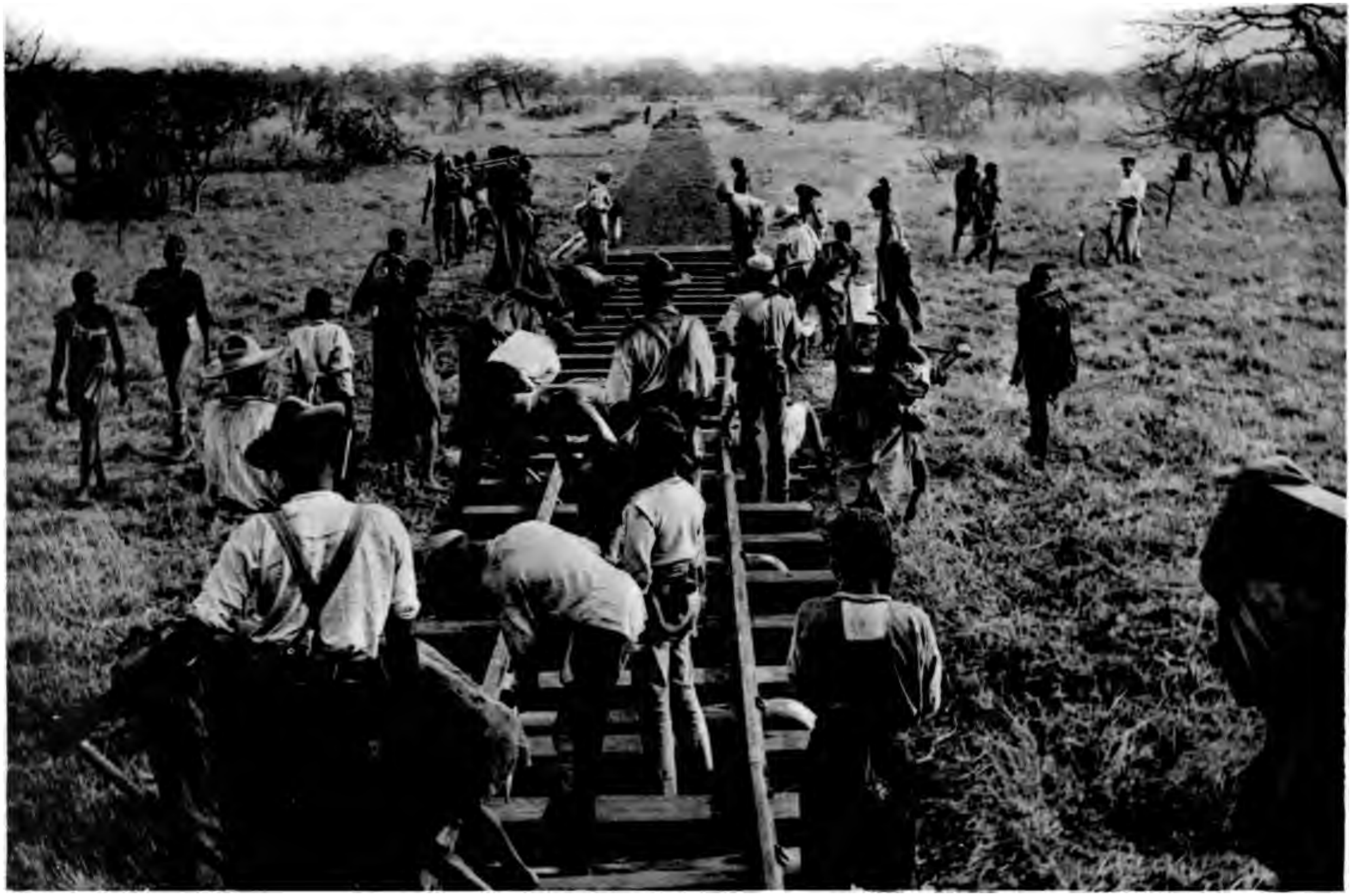
The Dunraven, notwithstanding a body of good ore, is disappointing in the lower levels.

The Criterion, and Christmas Reef, developed mines in the Buluwayo district, went wrong altogether in depth.

The Morven is a disappointment ; also the Nelly, the Dobie, and several mines in Mashonaland—all of these being floated companies.

no real market for these shares except in a boom.

These are the actual failures. But of the so-called payable mines—mines with even 20,000 and 30,000 tons of payable ore in sight—the great majority will never even pay off their par value. The market for most of this class of shares only exists when all South African stocks are rising. The moment these fall the average Rhodesian share becomes almost unsaleable. It seems to me, therefore, a double madness that people should care to buy these shares.



RAILWAY MAKING IN RHODESIA.

Examples of the typical 10-stamp mine.

The typical Rhodesian mine, with its narrow reef, short ore chutes, and ore in sight of from 10,000 to 30,000 tons is now getting ready to start crushing with 10 or 15 stamps. Of this class is the Matabele Sheba, Red and White Rose, Imani, Eagle-Vulture, Gatling Hill, Antenior, Yankee Doodle, Rezende, Jessie, Chicago-Gaika, and a number more I could mention. I will allow that these mines will mostly earn profits for a year or two, but in no case do I believe any one such mine will pay off its capital, still less its present market price. There are, of course, better mines than these in the country, but good and bad, from first to last, they are over-capitalised and their value exaggerated.

Rhodesia will be ruined by the London market.

In my notebook I came across a stray memo. reading ‘Rhodesia will be ruined by the London market!’ This was my opinion perhaps a year ago, and I endorse it to-day.

A great number of reefs in Rhodesia:

It is surprising the number of gold-bearing reefs that are known in Rhodesia. I suppose there are many hundreds. These were easily located because of the native workings on them, and a great number have been or are being exploited in depth. The extent of these ancient workings along the surface not only pointed out the direction of a reef, but—where they were deep, and persistent over a long distance—indicated that here probably was located a strong ore chute. Such special indications marked the long ore chutes in Selukwe, Globe and Phœnix, Ayrshire, etc. As regards many of the shorter ore chutes, those in gash veins, or on shallow, unconformable bodies of ore, it is probable that the ancients accounted for all the payable gold that existed in these patches. When such workings have been re-opened they have naturally exposed nothing that was worth following down.

the ancient workings on these.

A great deal of gold, but not in a payable condition.

There is, in the aggregate of all these reefs, a very great deal of gold. It is quite correct to say that Rhodesia is full of gold. But between gold, and gold in a payable condition, there is all the difference in the world.

The number of payable mines in Rhodesia.

My previous estimate was that there would be 30 payable mines in Rhodesia, of which one-half would be 10 or 15 stamp mines. I now believe that more mines than this will reach the producing stage, perhaps 40, perhaps 50. But most of these will be 10-stamp mines. Whether it is fair, however, to class this sort of mine as a payable mine is the question. It will open the country, help the revenue, support a population. But it will *not* pay the shareholder, because he buys at par, or at a premium, a share in a company which is ten times over-capitalised.

Possible future output of gold.

It is quite believable that before long Rhodesia may turn out 450,000 ozs. of gold a year. But that will not be the steady production of certain given mines month after month. Most of these small mines will have short lives. One will die out; another spring up; another come on a small rich patch; another shut down for a year's development, and so on. The country will benefit, but not the shareholders. For them over-capitalisation and exaggeration are now doing their work. For them Rhodesia will be a failure.

The mining districts of Matabeleland. Buluwayo district. Criterion and Christmas Reef.

Beginning at Buluwayo a survey of the country, there are two mines within a few miles of Lobengula's Kraal—**Criterion** and **Christmas Reef.** Both are failures. Each mine was developed extensively, and each went wrong in depth. These are now shut down.

Bembesi district.

Thirty miles to the north is Bembesi district. Here I saw the Morven and Queen's mines.

Morven.

The **Morven** showed a long run of ancient workings on the surface, but when developed was more or less a disappointment. There are small patches of rich ore; but large patches of poor ore counterbalance these. By this time the proposed 10-stamp mill should have started work. There is a good water supply, and facilities for cheap working, but I believe the mine does not come up to the typical 10-stamp property I have described.

Queen's (Willoughby's Con.).

The Queen's mine belongs to **Willoughby's Consolidated Company.** At first a lot of exploration work done here showed only unpayable ore. Then two ore chutes were found. One of these, on the 150 level, showed a length of 250 feet, a thickness of six feet, and a value of 37s. a ton. The other chute was shorter than this, with a narrower reef, but of better value. If these chutes continue down for a level or two, the mine may become a typical 10-stamp mine. I hope—when it is floated off as a subsidiary—that it will not be over-capitalised. The water supply here is not good.

Lower Gwel
district.
Leopard.

Following the road from Bembesi, N. for about 80 miles, you reach the Lower Gwelo. Here I saw the Leopard mine of the **Rhodesia Gold Trust.** Here again are the usual characteristics—a narrow reef and a short chute of pay ore. The reef is in diabase; the width is 3·5 feet; the length of chute 300 feet, and the value possibly 50s. a ton. The profit on working an ore chute of these dimensions, in an outside district of this sort, would be almost *nil*.

Veracity.

I believe that the Veracity mine in this district, belonging to the **Crescens** Company, is a mine of some promise.

Sebakwe
district.

Passing E. from here, through Sinanombi, the next mining camp of importance is Sebakwe. The working mines here are Globe and Phœnix and Chicago-Gaika.

Globe and
Phœnix:

Globe and Phœnix has been for some years the best mine in Rhodesia, but I am not prepared to say that it is so still. The reefs are narrow—there is the trouble. There are two reefs—each with a branch vein—making really four in all. The reefs run for a long distance, and the ore chutes are persistent. For several hundred feet down the mine has been a great property, but at each new level in depth—with narrow reefs such as these—the mining man who has lost his illusions gets more nervous.

basis of
valuations of
the shares.

In a mine such as this, even with results to date that may be entirely favourable, there is too great a discrepancy between the profit in sight and the market valuation of the shares. A mine may go wrong at any time. It is therefore not good business to take the great risk which the market expects one to take. To be satisfied with 10 per cent. interest (even in a mine like Globe and Phœnix) where there is two years' ore in sight, and eight years' ore to be taken for granted, is ridiculous.

This is an excellently managed mine.

The **Chicago-Gaika,** about a mile distant from the (a mine of the typical Rhodesian sort. If it is correct that reserves are 60,000 tons, worth 75s. a ton, it may be p rather high in that particular class. But I thought the n lying in a disturbed formation, and the various reefs were i in occurrence. I am doubtful about this mine in depth, a it may do moderately well for a year or two. The capitali far too high.

Near here is the **Empress** mine, which has turned appointingly. In any case the capital of £200,000 is absu

South of Sebakwe, 40 miles, is Gwelo. In this distr have been several mines floated in the last year or two— **Sharon and Shamrock, Waverley Block, Austen,** have not seen any of these, but I believe their prospects a '10-stamp' sort. On small capitals they might pay th holders, on large ones they certainly will not.

The Selukwe district is near here. The best mine undoubtedly the **Selukwe.** On the surface there were workings running for 3,000 feet, and when I visited the looked as if the first level at least was going to expose chute that length. The reef is a greyish quartz, lying most regularly, and dipping at 80°. Though not so ricl Globe and Phœnix and other mines, it is the best-looking longest ore chute in Rhodesia. I take the Selukwe to be of reef that will hold both in depth and in value. If wrong, those interested in Rhodesian shares may well d real profits coming out of the country.

As yet I suppose the mine to be looking all right i But its financial position is puzzling. It has worked for fo with good results, but never paid a dividend. Profits *m* been earned; but why, in the face of this, should the (have issued 15,000 shares at £2 to pay for additional equ Was there not enough profit to apply to this? The was far too high already. Why increase it? It now s £315,000!

ANTENIOR MINE, MATABELELAND, ONE OF THE TYPICAL 10-STAMP MINES OF THE COUNTRY.

Good as I believe this mine to be, I cannot endorse my previous recommendation to buy the shares at their present price.

Selukwe-Columbia

The **Selukwe-Columbia** was floated to work the Yankee Doodle reef. I believe this to be not more than the typical 10-stamp mine.

Wanderer

The **Wanderer** (Selukwe) is an immense ironstone body, full of bunches of quartz. In places it is 150 feet thick. Large patches of this ore show a gross value of 28s. a ton; but it is refractory. This ore would probably have to be treated by dry crushing and roasting, and even then the extraction would not be more than 24s. a ton. At this figure there would be a loss on working.

In spite of that, the Company was floated with a capital of nearly £300,000, and in the coming boom people will no doubt fall over each other in their anxiety to buy these shares at par.

Camperd

The **Camperdown** claim near here, which I inspected, I do not believe to be payable.

Moonie Creek.

The **Moonie Creek** I believe to be a 10-stamp mine.

Bonsor.

Bonsor is a mine that crushed for some years, and then had to shut down to develop more ore. When this work was finished there was a big debt. There is in this mine a well-defined reef, running a long distance, and going down all right, but in this the patches of unpayable ore are now shown to be frequent. Still, all this poor ore has to be opened up and driven through, and development charges are therefore high.

The Bonsor has so far failed to do what was expected of it; I cannot now believe it is going to become a regular earner of profits.

North Bo

North Bonsor adjoins the Bonsor, and works the continuation of the same persistent reef. It is intended to run 30 stamps on this mine. A recent estimate of ore reserves showed only 15,000 tons, so that years of mine development lie ahead for the company. The mine has yet to be proved.

Dunraven.

The **Dunraven** has had a good body of ore. This went wrong in depth, and evidently the life of the mine is now coming to an end. There is some ore in sight, but I do not think this will yield any profit to speak of.

Surprise.

The **Surprise** mine in this district is looked on as one of the best in Rhodesia. A recent estimate of ore in sight was 40,000 tons—worth 65s. a ton. This is a mine of the '10-stamp' type, though in this particular case there may be 20 stamps, and possibly fairly good profits for some years. But of course a year or two's profits will never pay off the capital of £175,000. To do this the mine will have to hold good to a considerable depth.

Belingwe district.

South from here is the Belingwe district. I was disappointed with most of the mines I saw here. The ore chutes are even shorter than elsewhere.

Confidence.

The **Confidence** mine was developed under a strong run of old workings, but the ore chute died out so rapidly that the company was put into liquidation. There were several thousand tons of payable ore in the mine, but no more. The unhappy shareholders, some of whom no doubt bought their shares at a premium, perhaps recalled the fact that the trial crushing of this mine went 24 dwts. to the ton. What a mockery to pick out a little bit of rich ore, call the result a *trial* crushing—and then to go into liquidation a year later!

Consolidated Bellingwe.

I saw the Dobie and Jumbo Claims of the **Consolidated Bellingwe,** but thought them poor. On the Dobie there is a short chute of good ore—perhaps 100 feet long—but this lies in a disturbed and broken-off piece of country. I do not think the reef will go down. The Jumbo is a big lode of white quartz, but low grade.

Anglo-French Matabele.

The **Anglo-French Matabele** Company holds some ground here and is opening up a reef lying in a regular formation. It gives some promise, but I thought it narrow and patchy.

Twenty miles distant is the **Sabi** mine. But for one fact I would look on this mine as good. There are several lodes, showing well in value to as great a depth as is sunk on them: there is a fine river running through the property; labour is plentiful, also grain; and close at hand is mopani wood—a fine mine timber.

Sabi.

The lodes can be traced running 4,000 feet through the property, but instead of being well-defined quartz veins, they are altered bands of schist, hardly distinguishable from the schist country rock. That is the weak point. I want to see a clean vein, not a lode which merges imperceptibly into country rock. Such lodes *may* be all right, but I do not like them.

Notwithstanding this the Sabi is a mine worth watching.

An adjoining claim, belonging to **White's Consolidated,** shows extensive workings on a giant vein which can be traced through the country for miles. I believe this to be low grade—a usual feature of these huge veins in all countries.

White's Consolidated.

The Great Belingwe claim belonging to the same company is a few miles from here. It is perhaps worth developing, but I did not think it likely to turn out payable.

The **Gatling Hill** mine I would instance as a typical 10-stamp mine of the country. The usual 20,000 tons of the usual 10-12 dwt. value are developed, but the reefs are narrow and the ore chutes short. Despite its careful management, I do not see how a mine of this sort can ever pay off its capital of £150,000.

Gatling Hill.

In the country between Belingwe and Buluwayo—a distance of over 100 miles—are several scattered mines, such as the **Nelly and Pioneer, Killarney-Hibernia, Red and White Rose,** and **Matabele Sheba.** These are all typical 10-stamp mines—which will help for a few years to swell the country's gold yield, but are too over-capitalised to yield profit to those who now buy the shares. The Red and White Rose was lately reported to have 20,000 tons developed, worth 78s. a ton, and the Matabele Sheba about as much, though of less value. The Killarney has probably more than this.

Nelly and Pioneer, Killarney-Hibernia, Red and White Rose, Matabele Sheba.

Gwanda district.

South from here is Gwanda, which I take to be the chief mining district of Rhodesia. But Gwanda is not what it was thought to be three years ago. The mines there were overvalued. Of the producing mines, Geelong and Antenior have not earned profits, and the West Nicholson appears to have been faultily sampled. Such mines as the Eagle-Vulture, Jessie and Imani, are only of the 10-stamp type, and the Sabiwa is probably the only new development of particular note. There are, of course, a number of claims in the district being opened. These belong to the different exploration companies, and as yet do not fall to be treated of as gold mines.

Geelong.

The **Geelong** mine is a big reef of hungry-looking white quartz. It is now realised that the payable ore in this mine is only a relatively small part of the whole bulk, and that it lies in patches rather than in chutes. The mine after crushing for a time had to shut down. The pay ore ran out. There was a delay, while more was being developed, and a debt was contracted. Now it is said that the mine can run regularly, and keep more stamps at work, and that a new reef of value has been found.

But I do not like this class of mine.

Antenior.

The **Antenior** has crushed for some years with 10 stamps—without making a profit. After a delay for more mine development, crushing has re-started, and the prospects are thought to be improved. But to pay off the debt contracted, the capital has had to be increased.

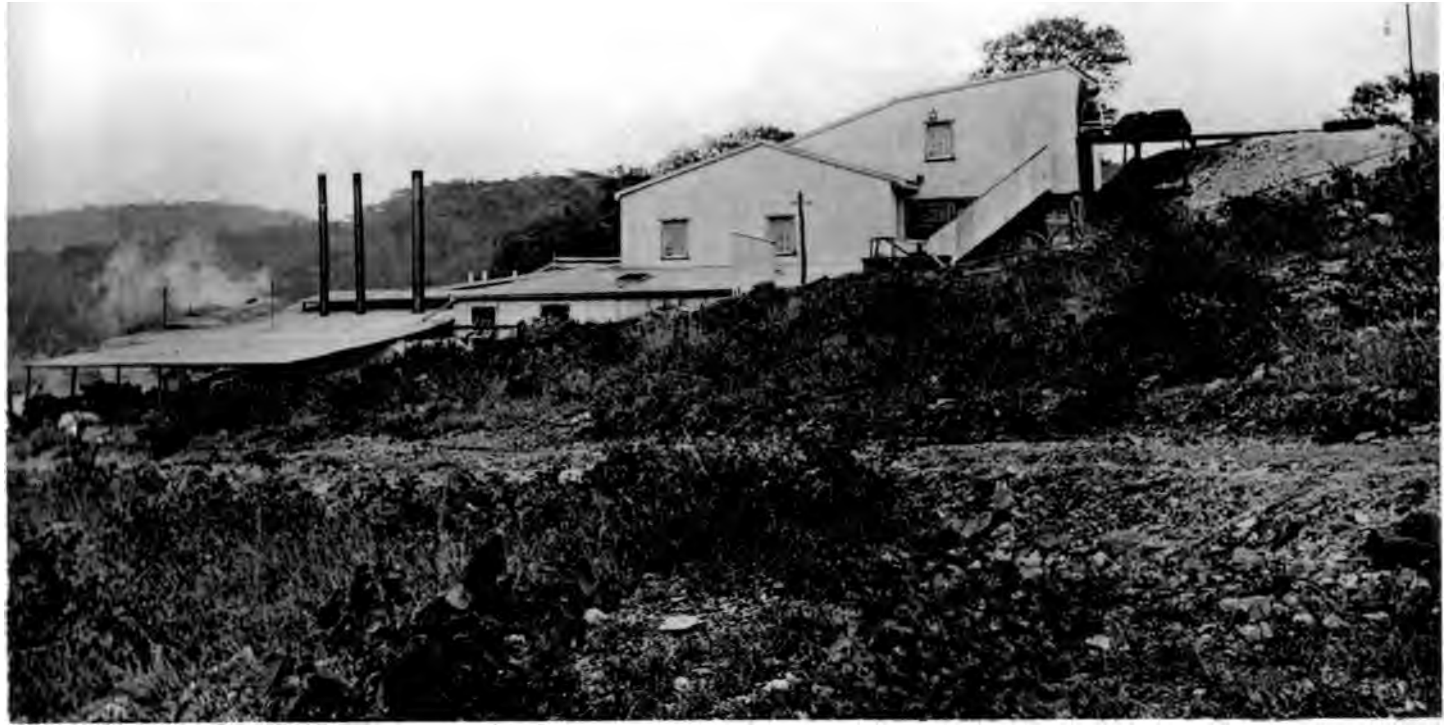
I do not think this mine can pay regular or substantial profits on its capital.

West Nicholson.

West Nicholson.—I have not seen this mine, but I really believed once that it was one of the big mines of South Africa. But it was re-sampled—and the shares fell to £1½! I advise holders to sell their shares.

Eagle-Vulture.

The **Eagle-Vulture** is a 10-stamp mine. Its generic characteristics are now, I hope, fairly well understood by the



BATTERY AT GEELONG MINE, RHODESIA.

reader. We pass to the **Jessie,** which is another of the same. Jessie. A recent report showed 14,000 tons in sight, worth 40s. a ton.

Several more of these typical Rhodesian mines—mines with narrow reefs and short chutes, which will keep 10 stamps at work for a few years, but which, being absurdly over-capitalised, will not yield the shareholder a profit—belong to the **V. V. Gwanda** V. V. Gwanda. syndicate. These are the Imani (which I saw), the Kameel, and the Australian.

The reef being developed by the **Sabiwa** is a big lode, and Sabiwa. so far seems to be holding in depth. There is also a longish chute, or several chutes on the property. I believe this to be a low grade ore body, averaging perhaps 38s. a ton, which will have to be worked on a big scale to yield much profit. I also thought that the ore was refractory—containing arsenic—but I believe the company's engineer says this is so only to a degree which will not interfere with a good extraction and a cheap method of treatment.

The capital of the company is £350,000. It is far too much.

In Mashonaland, although a great number of reefs are known, Mashonaland. and many are being developed, there have not been so many flotations. Most of the claims belong to the different exploration companies. In time, no doubt, they will be floated off as gold mines. In this country many of the reefs developed, especially in the earlier days, were failures. Fever, too, has always been a serious factor in retarding mining work.

The **Ayrshire** mine, to which a railway from Salisbury is Ayrshire. now being built, may in time become a fine property. The gold is found in a big dyke of diorite—which runs for a long distance, and has been proved by boreholes to five hundred feet deep—and one section of this appears to carry rock worth nearly 50s. a ton. But, as yet, not much of this has actually been developed. The estimate of a big tonnage that has been made is rather an inference of what may be there—judging from borehole results—than an estimate of ore really in sight.

It is certainly a mine of big possibilities.

Beatrice, Alice Proprietary.

Such mines as the **Beatrice** and **Alice Proprietary** belong to the 10-stamp class. Despite patches of unusually rich ore, I do not think their prospects are better than the other mines of this class.

Mashonaland Consolidated.

Of the same sort, probably, are several mines belonging to the **Mashonaland Consolidated** Company. These in due time are likely to be floated off on the usual over-capitalised basis.

Dredging in the Umtali River.

In the Umtali River, towards Manicaland, there are stretches of sand said to contain gold in a payable state. Several dredges are now being built to work these areas.

Manicaland.

Rezende, Bartissol, Grand Reef, Revue, Pardy's, Quagga, Sabi Ophir, Vaughan-Williams.

In Manicaland one again comes into a country full of reefs. Most of these are small, with short chutes of rather rich ore. None of these mines yet seem to have shown signs of permanence or real value in depth. Among these mines are **Rezende, Bartissol, Grand Reef, Revue, Pardy's Mozambique, Quagga, Sabi Ophir,** and **Vaughan-Williams.**

Penhalonga.

The notable mine in this part of Rhodesia is the **Penhalonga.** It is a strong lode, nine feet wide, lying vertically in a mountain, and opened and driven on by a number of adits. It is of low value, but the facilities for cheap work are unusual. There is water power to drive a big mill, good timber, and an abundant labour supply. The mine is near a railway, and the climate is healthy. The one drawback is the low value of the ore, but I believe the Penhalonga will some day be worked on a big scale and at a profit.

Tati Concessions.

At the other side of the country, in the Tati Concessions, there are one or two doubtful mines. Properly speaking, Tati is independent territory, but geographically the output belongs to Rhodesia.

Premier Tati Monarch.

The **Premier Tati Monarch** is a producing mine. People who have seen it say that, theoretically, the mine should really earn good profits, but somehow it never does. It is a case for extensive mine development, and a bigger output. All this means capital, however. I believe the water supply of the district is not good.

Blue Jacket

Other mines at Tati are the **Blue Jacket**, and several belonging to the parent concern.

Summary.

In summarising this account of Rhodesia, the reader will see that there is a lot of gold in the country, and that after a year or two there will be quite a big output. But the gold is rarely in a condition that will leave much profit on working it. The average 10-stamp mine of the country, although beneficial to Rhodesia as a whole, will not be profitable to those who hold shares in it. This is made especially certain by the utter over-capitalisation of the companies, one and all.

The future output.

Fever.

Then, too, the unhealthiness of most of the country must not be forgotten. Fever rages every season, and, at one time or other in any given year, almost every white man working on a mine is attacked. Many men will refuse to work at these mines. Some day, no doubt, the fever will be driven away, but in the meantime shareholders are expecting dividends.

Labour supply.

The great threatening trouble of a permanent scarcity of native labour, by the recent agreement with Mozambique, is probably got over. But this is no reason for buying Rhodesian shares. It does not put any more gold into the mines; nor will it make a 10-stamp class of mine payable.

Exploratio companies.

I have not dealt with the many exploration companies working in Rhodesia or financing the various flotations, except to draw attention to individual claims that I inspected, belonging to one or other of these. These companies, either here or elsewhere, do not come into the scope of this book. Some of them may be good, but I believe most to have poor assets and to be over-capitalised.

The B.S.A Company.

Finally, there is the Chartered Company. Up to the present this company has done a great work. It has overcome, year after year, obstacles that it seemed almost impossible to resist. Even now it is pushing forward several railways, and helping the finance of many of the mines. Behind it is the energy of a great man.

CHAPTER IV.

THE GOLD MINES OF WEST AUSTRALIA.

West Australia.

SINCE the first edition of this book was published, I have made two more visits to West Australia. Changes in many of the mines there have been so frequent that much of what I before wrote is out of date. I shall therefore deal with the mines as they now are, not as I first saw them.

Kalgoorlie has passed its zenith: the future lies in the Northern districts.

West Australian mining, to many people, simply means the Kalgoorlie field. But this account of the mines in the State will have the effect of showing that Kalgoorlie has passed its zenith; and that it is in the outside districts, to the north, scattered all over the great gold belt, that much of the future lies.

London boards of directors cannot be trusted.

West Australia, since the beginning of the mining there, has been a synonym for all that is bad in gold mining. Here and there a mine is now being worked with ability, and quite a number are being improved gradually in this respect. But of the boards of directors in London, I do not trust one in twenty. Intrigue and market rigging, repeated over and over again, have now eaten into the marrow of these people, and given the opportunity, they would break out again more violently than ever. Of course the public is to blame in putting themselves and their shares at the mercy of these men. But then the public, by a law of human nature, will continue to do this to the end of the world; and the people who pull the strings quite understand this law.

The output of gold will increase.

The prospecting of new districts.

But, in spite of all, this is going to be a great gold-mining country; and whether the evils connected with the industry improve or get worse, I know that the output of gold will go on increasing. Every year the prospector is going further and further into the heart of the desert, and he is making discoveries of gold reefs as he goes. These mines are getting opened up. The strings of camels, travelling through the nights, carrying supplies far out into the wastes, tell their own tale.

Lately found mines in these districts.

Of course not one new discovery in fifty means a payable and permanent mine; but many of them yield a small amount of gold, helping to swell the output, and every now and then there *is* a payable mine found. Look at such comparatively recent discoveries as Sons of Gwalia, East Murchison United, Westralia Mount Morgans, Merton's Reward, Bellevue, Cosmopolitan, Lake Way, Great Fingall, Long Reef, and Peak Hill! These mines are all far out in the desert, hundreds of miles from Kalgoorlie. Some of them are hundreds of miles from a railway. These mostly promise to be permanent mines. If the explorations in the outside districts continue to open up mines of this class—with such an immense area to be prospected yet—the mining future of West Australia will be a remarkable one.

Worthless mines.

We still have, of course, the many worthless mines floated in the first boom, and a number of the more reputable properties, although always yielding a little gold, will never pay. But there is a backbone of good mines now, whose managers are trying to place them in a sound state. It is probable that mines floated in the future will have some guarantee of value.

Government.

Mining leases.

Water rights.

Labour conditions.

A word or two as to government. The mining laws of the colony are, on the whole, sound; ground can be taken up for mining purposes on payment of £1 an acre per annum, and can be held under these conditions for 21 years, with, it is to be presumed, right of renewal. Water rights can also be pegged out for a tax of £1 an acre per annum. No lease can be for more than 20 acres, and should a single lease or a block of amalgamated leases be worked as a company, at least one man must be employed for every six acres held. This is a sound regulation. It prevents capitalists taking up large areas of country, which they have no intention of developing. I wish we had it so in the Transvaal; but it is bound to come in time.

Railways.

The railways of the State—owned by Government, as are nearly all lines in Australia—are well run and efficient. I should like to see several extensions put out into the country beyond Menzies; but that raises the question of funds. Looming over everything, politically or financially, in West Australia at present, is the awful Coolgardie and Kalgoorlie water scheme.

The Coolgardie water scheme:

There were 150 English-floated mines in the Coolgardie district, many of these were so worthless as not to be developed at all; nearly all the rest shut down after a short history, and a bare dozen, or less, have kept going till the present. One only, I think, pays regular dividends. These mines have sufficient water to get along with: they always had. And yet, because in days gone by Coolgardie and other neighbouring districts had several strong men in Parliament, who could perhaps turn the Ministry out if not placated, the colony was pledged to this outrageous water scheme. The colony was already heavily in debt. No mining engineer was asked to report on the value of the mines and the quantity of water they really required, and it was known that the scheme involved engineering problems which could not be definitely pronounced on. These facts did not weigh with the Ministry. So it undertook to pump water into the goldfields, a distance of nearly 400 miles, and to pay several millions to complete the scheme. The first estimate was for £2,225,000; but already that has been altered to £3,500,000, and it seems quite certain that the eventual cost will be over £4,000,000. And this in a State of 170,000 inhabitants! Every item in the work is taking much longer than was estimated, and is costing nearly double. The drain on the finances of the State is a most serious one. It was said originally that water would be delivered on the fields at 3s. 6d. a thousand gallons; but I have seen a late estimate that it will cost, to deliver, at least, 8s. But at Coolgardie, Kalgoorlie, and all the near-by mining districts enough water cannot possibly be sold to earn interest on the great outlay. If this money, or one quarter of it, had only gone in railways, in a public sulphide plant for Kalgoorlie, in public batteries at the different small mining centres, and in diamond drilling to prove a number of the outside reefs in depth, it would have done untold good. Of course it is too late now.

how it originated:

what it is going to cost:

why it was not needed.

Coolgardie mines and the scheme.

When the water supply reaches Coolgardie—goodness knows when that will be!—the people who control the mines there will use great effort to make money out of it. Picked parcels of ore will be gouged out of the mines; all the little stamp mills will be started up; and for a few months this picked ore may make a fair showing. But let me assure readers of this, that these Coolgardie mines are no good at all. They can all be made to furnish ore for a month or two's crushing, but there will be no real profit on the work. I inspected 13 of the mines in the district. With the exception of Burbank's Birthday, I saw no mine with any signs of permanence. If, therefore, a market rise is engineered in shares of Coolgardie mines, on the assumption that the water supply is going to change the situation, outside shareholders in these must promptly sell out without any hesitation.

Drawbacks to the Coolgardie district.

The drawbacks to the mines in the Coolgardie districts I summarise in the words I used before. These are:—

Short ore chutes.

1. The gold chutes when found are narrow in extent, often not aggregating more than 200 feet to a mine. This, too, may be split up into several chutes.

Low value of ore.

2. The value of the ore, even in the chute, is low grade; picked specimens and assays prepared for shareholders' meetings often give high results, but its average value in the chutes is not over 40s. to 70s. a ton. The tonnage is often 'cooked' to bring the yield out at '1 oz. or 30 dwts.,' but a reference to the cost sheet will show that the unusually high costs betray the manager's secret.

Hard rock and chutes dipping obliquely.

3. The country rock is exceedingly hard, and as the chutes dip rapidly, more and more dead work has to be done at each level to reach the payable ore. I venture to say this is one of the most important facts against the value of Coolgardie mines, and it is simply ignored by local mining men. They never take note of such a thing as the cost of development of the ore. All costs are reckoned on mining and milling only. The several hundred feet of driving necessary to reach a chute is mentally written off by the manager. He cables to London that a certain block of ore will yield a profit of £1,000; it is mined and milled and this sum is

actually made. This fact he wires to the head office; but quite forgets to state that it cost him £800 of dead work to reach the ore. There is really therefore only a profit of £200 instead of £1,000. Furthermore, neither he nor the directors realise that the £20 profit, the result of say three months' work, is not sufficient t pay interest on the capital sunk in shafts and equipment, let alon enough to pay interest on the heavy nominal capital of the compan

ost of
evelopment.

4. The ground is often severely faulted.

aulted
round.

5. The scarcity of water is serious; but more serious is th scarcity of gold. The few mines which have any ore wort working can also get water for the purpose.

carcity of
ater.

I adopt this uncompromising attitude towards the Coolgardie mines, because I know their limitation so well. If mis-statements about their value are put abroad, people will only again lose money in them.

Most of the Coolgardie mines have now dropped out of knowledge. Of many spoken about even as recently as three years ago, one never now hears anything.

ondonderry.

Londonderry, after being reconstructed, was worked for a year or two on the two small pipes of ore carrying occasional rich pockets. This work did not pay, and I believe the mine is now shut down. There is a fairly good water supply here, but no use for it.

ayley's

Bayley's United. The ore in Bayley's held good for 500 feet or so in depth, but the characteristic of this district—loss of value—has now overtaken the mine. I hardly think the ore will again improve as it goes deeper; it is not the usual way in a quartz mine.

ady Loch.

Lady Loch. The ore in this mine, from the assays shown me, was worth 50s. a ton, but there was only a limited quantity of it. At present a fair value recovered from the small tonnage treated, but I do n ere is any certain future in sight. Here again the mple water for all needs.

Yale of Coolgardie. When I visited this mine, nearly four years ago, there were 25,000 tons of ore opened up, worth 60s. a ton. That has now been worked out. The present yield does not reach this figure, so apparently in depth the value is gradually dying away. This has been quite a well-handled mine.

Vale of Coolgardie.

Sherlaws. The chutes in this mine are too short to be of much value, and the ground is exceptionally hard to drive—a bad combination.

Sherlaws.

Burbank's Birthday is still the best mine in the district. But this class of mine—especially in a district where values become poor at so shallow a depth—can only become a sound investment when ore is actually opened out for many years ahead. It is absurd that a mine like this, liable to give out at a moment's notice, should be capitalised on a 10% basis, with ore in sight for perhaps two years only. Such a thing is quite frequent in mining finance, but for all that it is a wrong standard of valuation. This mine is well handled.

Burbank's Birthday.

Of other small producing mines in the district, I have not kept close records. One month they earn a profit; the next there is a small loss. At the end of the year the London office costs, depreciation, and mine development, absorb all the balance. As they get deeper the chance of the value falling off becomes stronger. This class of mine cannot be permanently benefited by the water scheme.

Other small mines.

A stamp mill is being put up on one portion of the big **Hampton Plains** estate, near Coolgardie. Before this the reefs there gave no signs of permanence.

Hampton Plains.

All the southern mining districts, for which Coolgardie is the centre, have failed to do any real good. As examples, witness the position of the Yilgarn field at Southern Cross, and the Dundas field at Norseman.

At Southern Cross the **Fraser's South, Hope's Hill,** and one or two other mines struggle along on the 'profit one month, loss the next' basis. There seems to be no assured future for them.

Southern Cross mine

Norseman mines.

At Norseman the **Norseman** gold mine is still working, making the best of a small reef in a hard rock. But there is no profit in it. This has been a well-managed mine.

Several Australian-owned mines in this district—such as **Lady Mary** and **Princess Royal**—produce gold with more or less regularity. The last-named pays an occasional dividend.

Kalgoorlie.

From Coolgardie to Kalgoorlie is 20 miles. Here is situated the Hannan's belt— the mining centre of West Australia.

The rich ore here led to a big conspiracy to rig the market!

This field has had an extraordinary history. It was discovered in 1893. and began to produce in 1894. Some of the mines which have turned out best, were practically swindles at the time they were floated. No ore was exposed in them. Since then discoveries of ore worth millions have been made. By the year 1898 the mines were being actively developed in depth. Wonderful bonanzas of ore carrying tellurides of gold were found, and on the strength of this mine managers and directors combined in a really gigantic conspiracy to rig the market—which they did with great success. These rich spots were of course soon worked out, and as the yields of the different mines fell off, a big reaction set in. Kalgoorlie is still suffering from the effects of this. But at the same time, although the richest of the ore is unquestionably worked out. this goldfield is still in many respects a remarkable one.

The local management is now better,

The properties are now mostly being opened up in a miner-like way. The results, with depth, are found to be comparatively good. The class of manager being put in is a guarantee of greater honesty—at that end.

but not the London management.

Of course the weak point is the character of many of the London directors. This bad type is almost impossible to reform. The only way is for the shareholders to get rid of him altogether. These Kalgoorlie mines, with their rich patches of ore, are the very class of mines where this person can do real damage. Given the least opportunity, and a manager who can be silenced, we should see a repetition, on a smaller scale, of the incidents of the last three years.

Hannan's Belt.

The Hannan's Belt, in which formation all the mines are situated, extends for six or seven miles in length, is about a mile-and-a-half wide, and lies, approximately, north and south. This same formation may extend for a much greater distance, but no gold has ever been found outside the present area. In this formation, also running north and south, are a number of parallel lodes, which seem to carry gold, although usually in unpayable quantities, throughout their entire length. These lodes, although as yet they have not been continuously traced from mine to mine, nor has any geological survey of the area been made, do not appear to be regular in their occurrence. They seem to run for a certain distance and then either die out or branch into other lodes, and so become lost; in other words they are lenses. In places the same lode can be traced with certainty for several thousand feet in length, but generally the work done does not prove a length of more than a few hundred feet. As a rule, the lodes, though nearly vertical, dip very slightly to the west, but in places they are found dipping to the east, at least for a level or two. Several of the lodes have already been proved to a depth of from 700 to 1,200 feet. As to the nature of the lode matter, it seems to be a mixture of talcose, schist, diorite, and quartz, heavily mineralised throughout—but in the decomposed ore of the upper levels the schistose matter is more prominent, while the deeper the lode goes the quartz element becomes more pronounced.

Geological features.

Many unpa
able mines
Hannan's.

A section taken across the present exploited width of the Hannan's Belt would reveal possibly fifty distinct gold-bearing lodes, and also the presence of gold, although in small quantities, in wide stretches of less clearly defined lode matter, so much so, that several authorities have assumed that the whole belt may consist of auriferous dyke or lode matter. As before stated, the gold although spread over so many different lodes is generally in unpayable quantities.

Many of the mines floated on the Hannan's Belt have not been found to contain a single ton of payable ore. A still larger number, after years of development, have been found to contain minute patches which would pay to work, but for all practical purposes they are in an equally hopeless position. There are perhaps a dozen mines, the owners of which think they are payable —although they really are not; and finally there are the mines which do pay. Practically all the payable mines lie in an area embraced by one square mile, and work parallel veins running through this area. All round this central spot, radiating out in all directions, are the shafts and headgears of probably a hundred mines, floated on the success of the few good ones. A few of these mines are still spending money in exploration, but most are shut down for ever. The shafts of some of these yield good water supplies, which are leased to the working mines.

The central area and the good mines.

A summary of the Kalgoorlie mines;

Let us assume that the Kalgoorlie field to-day has four large producing mines which have more or less assured futures; six large producing mines which have not as yet assured futures; and about a dozen other small producing mines of quite doubtful future, to the shares of which, however, the market assigns a considerable value.

The best mines;

the second best;

the small producers.

The four best mines are Great Boulder, Boulder Perseverance, Ivanhoe and Golden Horseshoe; the less assured mines are Associated, Lake View, Hannan's Brownhill, Kalgurli, South Kalgurli, and Associated Northern Blocks; the small producers are Hannan's Oroya, Hannan's Star, Hannan's Reward, Hannan's Proprietary, Brownhill Extended, Golden Link, South Boulder, Crœsus South, Central and West Boulder, Ivanhoe South Extended, Hainault, and Great Boulder Main Reef. Some of these mines, such as Boulder South and Ivanhoe South Extended, I think nothing at all of, and of the rest I have a poor opinion.

Oxidised and sulphide ores

The Kalgoorlie of to-day is a field of sulphide ore. The Ivanhoe, Horseshoe, and Kalgurli mines have still blocks of oxidised ore to work; but the oxidised ore in Great Boulder, Boulder Perseverance, Lake View, Associated, Hannan's Brownhill, South Kalgurli, and Associated Northern is worked out.

The transition from one to the other was handled very badly.

The transition from free milling to refractory ore was handled in about as bad a way as it possibly could be. Each manager had his own special process of sulphide treatment, his special type of furnace for roasting the ore, and his special way of advertising its peculiar advantages to the mining world. The result, of course, was that most of the plants put up were either unsuccessful, or imperfect in many details. The ore was not properly roasted, and not properly leached. The residues assayed alarmingly high. The yields fell off, or never approached what had been expected; the shareholders naturally took fright, and the shares fell heavily in value. All this was on the head of the intrigues and market rigging of a short time before. It is no wonder that Kalgoorlie mines are held in poor repute.

Sulphide treatment:

The treatment of the sulphide ore, although necessarily expensive, is really quite simple, and the change could have been brought about with no disturbance to speak of. When the managers of all the producing mines saw that the sulphide problem was coming near, they should each have advised their directors to subscribe to a general fund which would have been devoted to experimenting as to the best treatment. Several leading metallurgists could have been retained, and if necessary £100,000 could have been spent on experimental plants of all sorts. It is certain that a process would have been evolved as the result of this which would have included the most favourable features of each plant now in use, and which would have been cheaper than any individual process now in use. This seems a simple enough procedure, but the mine manager, for all his good points, is vain of his acquirements, and each manager at Kalgoorlie thought that *he* had solved the problem. And so they all went along in their own way, and cost their companies in the aggregate well on for a million sterling in useless machinery, poor extractions, and delays—to say nothing of the cost to shareholders in market depreciation and loss of confidence. Even now they are still hard at work changing machinery. The Associated plant has had to be half remodelled; the Kalgurli furnaces are changed; the Perseverance residues will have to be re-treated; and so on. It has been a wretched business from beginning to end. Now, a gradual improvement is taking place in the type, or types, of sulphide plants, and costs are consequently being got down; but still the damage has been done.

how it should have been worked out:

how it *was* worked out.

Different methods now in use.

Apparently, the dry crushing and roasting plant of the Great Boulder, Boulder Perseverance, Kalgurli, and South Kalgurli—with small local modifications in each plant—is preferred by one class of metallurgists, and the fine crushing and wet treatment of the Lake View, Hannan's Brownhill, and Hannan's Star is preferred by the others. No exact figures of these different methods have been prepared that I know of. But one or other of these *must* be the cheaper. Which is it? And is the difference in cost so great as to warrant all the mines throwing out their badly-designed plants and erecting those of the better design? In this respect the Ivanhoe, which as yet has not put up a sulphide plant, has the choice of methods.

Working costs at Kalgoorlie to-day.

I have analysed the costs of Kalgoorlie mines treating sulphide ore. Including expenditure of all sorts, and depreciation, the average is fully 50s. a ton. In some mines it is more than this, but in these cases a reduction to 50s. seems likely. This is too high. Of course the tendency on a settled mining field is always towards a cheapening, but a reduction to an average of 45s., at most, should be the standard managers set themselves.

Mining facilities: Labour,

Water,

Fuel

Coal,

As to mining facilities: Labour is fairly good, and though powerful, does not assume the arrogant tone it does in Colorado and Montana. Water is scarce, and bad at that; but by pumping from outside mines, and condensing, it is made to do. I do not know to what extent the managers expect the advent of the Government water supply will benefit them. The fuel used continues to be the wood cut from the great tree-covered areas of the State. It is being cut down fast, but relatively the area is so great that the cost of a few miles extra haulage is not serious. West Australian coal has been tried, but the rail haulage of this 500 miles more than neutralises its extra steaming power.

Sidings.

The railways, as I have said, are good, and as each producing mine has its own siding, for the off-loading of fuel and stores, they yield a maximum of efficiency.

Value of the mines in depth.

The real trouble th[illegible] ldfield has to face—the one outstanding fact which I [illegible] e readers of this carry away in their mind is tha[illegible] le[illegible] s are getting both smaller and poorer in depth. *The chutes contract.* That, in three words, is the summary of all the work that has been done on the field for the last three years.

Values in 1898 and to-day.

When I was first at Kalgoorlie, in 1898, the mines were at their very best. Immense stopes in the Associated scintillated with splashes of telluride. The wonderful Lake View bonanza was just being opened up. The Kalgurli mine, at its then depth, promised to be a great property; and the Boulder, Boulder Perseverance, Ivanhoe, Horseshoe, and Hannan's Brownhill, working on their long oxidised chutes, gave one the idea of absolute soundness. A year later than this commenced the period of intrigues and market rigging, in which managers or officials on the mines acted in collusion with directors and speculators in London. By this time it was known to insiders that the lowest developments in such mines as Lake View, Associated, and Kalgurli were not good. Here, then, was double security for the *coup* these men made. First, the shares were sent rapidly up, as a result of crushing the very rich ore in sight, and then, when they had sold the shares short, the bad news about the bottom levels was allowed to leak out. It was a certainty either way; they caught it coming and going.

Some of the big mines go wrong in depth—

Further development demonstrated only too clearly how rapidly the ore chutes contracted in depth in these big mines.

such as Lake View, Associated, Brownhill, and Kalgurli!

In Lake View the long chute of oxidised ore on the first level has narrowed to one quarter the length at the fifth level; the rich Tetley chute in Associated has literally come down to a point below the seventh level, and the Australia East chute seems to have almost disappeared too; the Kalgurli chute has narrowed from the valuable first and second levels into a mere pipe below that; the Brownhill has had no permanent ore body below No. 5 level; the Great Boulder chute in depth, although showing no signs of giving out, is much shorter than near the surface—and so on.

Map shows cor or d

On the accompanying map is shown the area of the original ore chutes, and the size to which they have now narrowed down in depth. This shows better than words the present position of Kalgoorlie—as compared to what all mining men thought it *might* have been on the showings of ore in 1898.

The value of the field depreciated one-half.

This contracting of the ore chutes in depth has lessened the value of the Kalgoorlie goldfield by at least one-half. Of course all the big mines are affected in different degree. Some as yet show no serious falling-off. In cases, too, new chutes are found to make in depth, taking the place of those that die out. But on balance there is a big depreciation in intrinsic values with depth.

A story of the three different zones of reefs at Kalgoorlie.

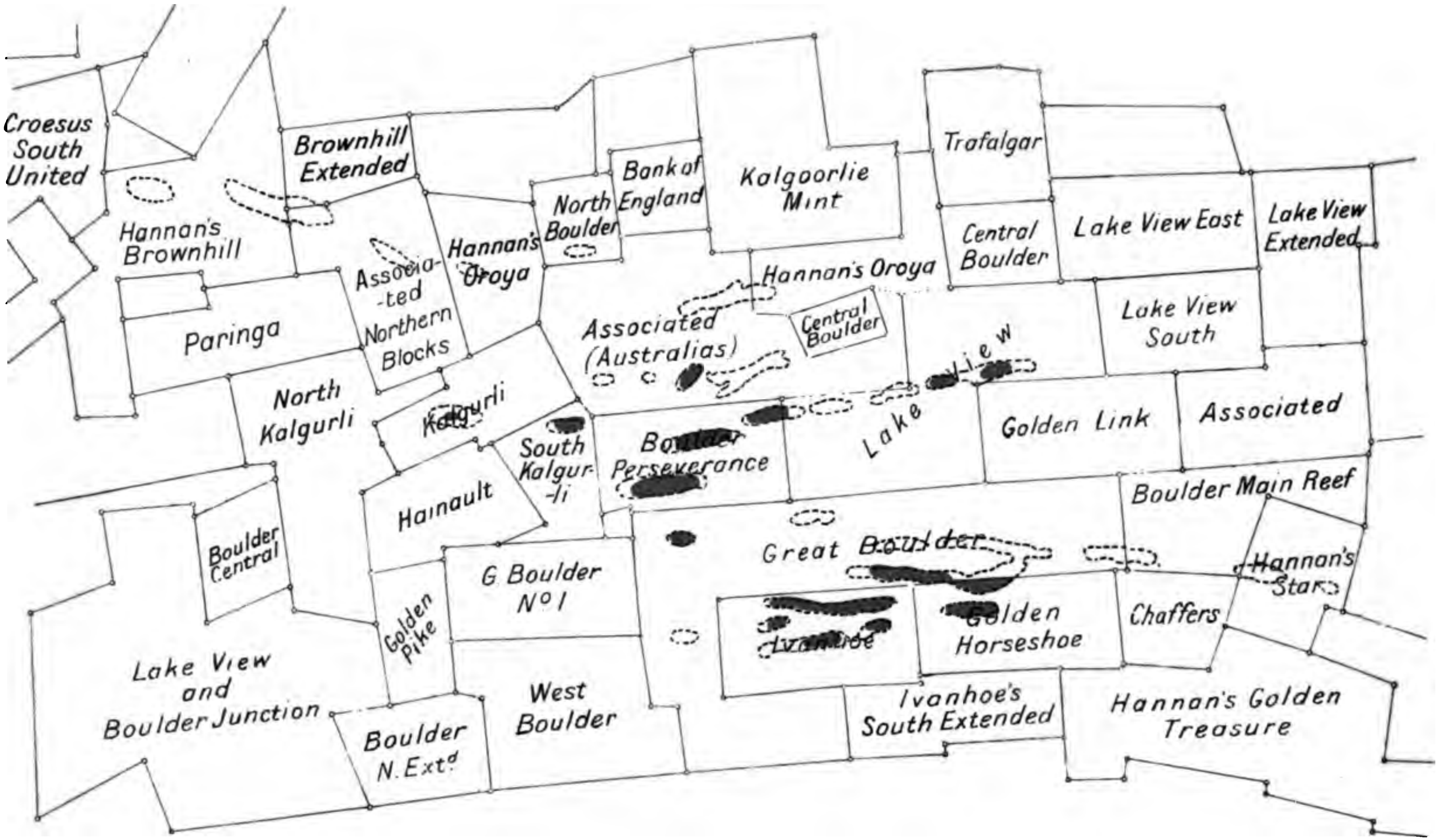
The Western zone—

favourable nature of the reefs in this.

There is a fact of importance which would-be speculators in Kalgoorlie mines should know of. A glance at the plan will show that there are three lines or zones of reef, on which the big producing mines are working. The Western zone runs through Hannan's Star—where it is poor—on into Boulder Main Reef, Great Boulder, Horseshoe, and Ivanhoe. Beyond this it again becomes poor. This line of reef, or reefs, is, in all senses, the best of the three. It is the backbone of the Kalgoorlie field. The ore is more persistent with depth for one thing, and for another it is much less refractory to treat. For example:—In the lower levels of the Great Boulder the ore is quite quartzose in nature, and at least 40 % of the gold is free and is caught in the amalgamating pans. This fact assures a high extraction. In the Ivanhoe, the gold in the sulphide rock is still freer than this. An experiment on nearly 500 tons, by ordinary milling, concentration, and cyaniding, gave an 84% extraction. On this basis it will pay to work the sulphide ore by the present stamp mill. This is a great saving to the Ivanhoe Company.

The ore chutes in the Western zone

Of course this line of reef is subject—though not to an extreme extent—to the contracting of the ore chutes in depth. The main chute of the Great Boulder has narrowed down to 600 feet or so in length. Near the surface it was worked for probably 2,000 feet! The chute in the south end of the mine, worked from the Lane shaft, has



Section of Hannan's Belt, Kalgoorlie, W. A.

The chutes of payable ore are shown in dotted lines. Those that appear to be holding down to a considerable depth are coloured red.

died out altogether, and apparently the ore in the Boulder Main Reef mine, which is part of the same chute, has also given out. In the Ivanhoe, too, a falling-off in the length of the chutes in depth is seen. The Horseshoe has a short chute in any case. I do not know that its length has contracted in depth, but the width has probably decreased. This line of reef, then, is the most persistent of all, and the least refractory. If any mines on the field are to be worked to a great depth, I am sure that it will be the three big mines on this line of reef. Let investors bear that in mind.

The middle zone:

The middle zone, or series of reefs, can be traced through Lake View South—where it is worthless—on through Lake View, Boulder Perseverance, South Kalgurli, and Hainault. In this zone, the ore contains only a little free gold, making it more difficult to obtain a high extraction, and the chutes of rich ore are more treacherous. The Perseverance, according to official reports, still has good ore in the bottom of the mine—perhaps not so much as at the shallower levels—but the Lake View mine has gone terribly wrong in depth. This makes me naturally distrustful of Perseverance and South Kalgurli. The owners of these mines need to safeguard themselves by extra fast mine development.

its characteristics.

The east zone—

The third, and most easterly zone, runs through Central and West Boulder, both blocks of Hannan's Oroya, Associated, Kalgurli, Associated Northern Block, Brownhill Extended, Hannan's Brownhill, and Crœsus South United. In this, there is practically no free gold, and, what is far more serious, utter unreliability in the ore chutes.

the reefs here are treacherous in the extreme.

Along this line of reef, two discoveries of value have been made since my first visit to the field. One was the ore body which commenced at the south end of Hannan's Brownhill, and ran through a corner of Brownhill Extended into the Associated Northern Blocks. The other was a body found toward the south end of the Northern Blocks, which is also supposed to have been located in the north lease of

A record of the mines on this zone.

Hannan's Oroya. But these are shallow discoveries. They are rich ore, but may never last to a depth. If they do, it will be contrary to the history of mines along this line. To-day, Hannan's Brownhill, Associated and Kalgurli, are mere shadows of what they were four years ago, and the smaller mines along this line have also been failures. The chutes go wrong altogether in these mines as they go down. It is a pitiable record. Whether they will ever turn into permanent mines, it is impossible to say, but of course the evidence is against them.

A summary of Kalgoorlie mine values to-day.

This, then, is the Kalgoorlie field of to-day. Mine wrecking, and serious mistakes over the sulphide problem, have left their mark on it. The ore is found to die out in depth, and the future of nearly all the mines is a matter of grave doubt. Of course, there is rich ore left in the mines still, even in those that have turned out worst. I suppose this fact, and the always-recurring possibility of making other big discoveries, keeps most of the shares at the prices they are. If judged calmly, on intrinsic values, as we would judge Rand dividend-paying mines, these Kalgoorlie mines are seen to be wanting in soundness, and are not investments, strictly speaking. Of course they have a speculative value, and some of them will pay big dividends on ore in sight. But to capitalise these mines on a 10% basis, with ore in sight only for two or three years, and chutes that are contracting in depth, is only poor business. It is not worth the risk.

I will describe the mines one by one.

Great Boulder. (Issued capital, £175,000 in 2s shares.)

Great Boulder is the soundest mining property on this field. It has been brought into this position by sheer good management. While other mines have been stinted in development, the policy at the Boulder has been to keep sinking and opening levels as fast as possible. Consequently, the main shaft to-day is about 1,300 feet deep, and a borehole shoved ahead of this, has located the reef at 1,500 feet. The mine is only worked out to an average depth of 250 feet, so that there are about ten levels of ore standing intact. This is mining as it ought to be. Of course the main ore chute has contracted very much, and the lower levels contain nothing like as much ore as did the two top levels, in the oxidised zone.

Value in depth.

I suppose the length of ore worked in these was 2,000 feet; but probably the 10th level, at 1,000 feet, will not have more than 600 feet of ore. As far as can be seen, though the chute has contracted very much already, it is not showing any signs of really giving out altogether. Therefore, the future of the mine still seems to be a bright one. It will take a number of years to exhaust the mine to its present lowest points. Other than the main chute, there are no reserves of much value; all the ground has been prospected thoroughly by horizontal diamond drill-holes put in from each level. The chute of ore worked in the upper levels from the Lane shaft, has given out in depth. This may be more than balanced by the finding of some good ore in the vicinity of the Jansen shaft—at the north end of the property. Several drill-holes here gave good results.

Ore reserves.

Estimate of yields and profit.

The Boulder, treating 6,000 tons a month, and with its old tailings exhausted, should be able to produce about 8,500 ozs. fine gold a month, at a profit of £20,000. This is equal to a dividend of 2s. 6d. a share a year, with a margin for depreciation.

Ivanhoe. (Issued capital, 200,000 £5 shares.)

Mine development.

Ivanhoe. It is strange that, at the time I write this, the lowest level on the Ivanhoe is only 500 feet, while at the Boulder, barely one hundred yards away, it is 1,300 feet. This, too, has been quite a well-worked mine, but the energy has been lacking, and perhaps the dislike to draw too much on current profits for mine development. Down to 500 feet this is a great mine—although there is a distinct shortening of the ore chutes. As to what it will be below that, we have the evidence of the Boulder main ore chute, which is within a short distance of the parallel chute worked in the Ivanhoe. I think the chances are that the mine will at least hold moderately well in depth. The free milling nature of the rock, too, is a favourable point.

Estimate of profit.

At a rough guess, I place the ore above the 500 foot level as enough for four years' supply for the 100 stamp mill. Below that prospects are hopeful; but then the ore is not developed. There is the weak point. On a monthly yield of 9,000–10,000 ozs. l easily be possible to pay a dividend of 20%.

But how long can that be continued? The shares are good, as mining shares go, but the mine *must* be more actively developed to put them on a really sound basis.

The Great Boulder, Ivanhoe, and Horseshoe—for a cogent reason—should be amalgamated.

The Great Boulder and Ivanhoe mines should be amalgamated. The principal reef in each mine is within comparatively few feet of the other's boundary. Any sudden change in the formation might carry both reefs into one mine. In the same way, the Golden Horseshoe should be added to the amalgamation, for its principal reef lies close to the Boulder boundary. An equitable amalgamation of these mines now, might save a serious collapse for one or other of them in the future. The amalgamated company would own the best stretch of ground in West Australia.

Golden Horseshoe. (Issued capital, 300,000 £5 shares.)

Golden Horseshoe. About this mine I have a less clear impression at present than about any other on the field. It has only a short ore chute, but the lodes are wide and of great value. I take it there are now ore reserves in sight for at least several years. The best stretch of reef—the mainstay of the mine—lies only a few feet from the Great Boulder boundary. A quick turn in the formation would therefore carry it into that property. Because of this I advise for an amalgamation of these two mines—to which should be added the Ivanhoe.

Horseshoe shares, relatively to the amount of ore in sight, stand at a ridiculously high price.

Boulder Perseverance. (Issued capital, 175,000 £1 shares.)

Boulder Perseverance. This mine is now in first-rate order. There seems every reason to think that on ore in sight it can yield 150% dividend for the next three or four years. But with past experience on this field, especially with the result in the adjoining Lake View, it is not justifiable to capitalise this mine on a 10% basis. Until much more is known of this mine below the 500 foot level, I cannot see that the shares have any right to stand at over £10. Still, the mine, with proper development, may turn out a great property.

These four mines, I consider, are at the time of writing, quite ahead of all others on the field. Their prospects are not what they once promised to be, but still they are quite good enough. Active development is all that is now needed.

Lake View. (Issued capital, 250,000 £1 shares.)

Lake View. The main ore chute in this mine has contracted with appalling rapidity. At the 500 foot level it is found 200 feet south of the shaft—but is only 200 feet long. This is less than it was at the 400 foot level. At the 800 foot level of the Golden Link two horizontal boreholes were put in to locate the continuation of this chute. But they did not even cut ore. The reef has therefore either faulted or died out altogether. A recent discovery of payable ore has been made north of the shaft at the 700 foot level. This may be a new chute of ore; but chances are against it being important. At the time of writing, the future looks bad. Unless there is a big improvement, the monthly yield will soon fall off greatly.

Value of the shares.

I cannot see that Lake View shares—the shares of a mine which four years ago looked splendid, and which three years ago was turning out 33,000 ozs. a month—are worth anything above par.

Are they even worth that?

Associated (Issued capital, 492,678 £1 shares)—

Associated. When I first saw this mine, in 1898, I thought it, on its then showing of ore, the biggest in West Australia. A year later, when the management officially stated that there were over a million tons in sight, of an average value of 36 dwts., I felt that my earlier views were confirmed. I did not know that, in the interim, most of the rich ore showing at the time of my visit had been worked out; that the lower workings had run into poor ore--showing the chutes to be contracting fast, and that this official estimate of ore in sight was simply a lie. And yet all these false assays were entered in the books, and for months directors and shareholders were completely deceived about the real state of the mine.

has been a great failure in depth;

The mine went wrong altogether in depth. The Tetley chute of ore narrowed down to a point, and below 700 feet seems to have died out entirely. The Aus
chute, which gave immense stopes in the oxidis

not last down even to 400 feet. As for the other great ore bodies, on the extensions of these chutes, which were officially stated in every weekly report for two years, to be worth 30 dwts., these were found to have no real value.

From this poor condition the mine has never recovered. A great deal of prospecting from all the levels has opened only one ore body of any size—the No. 2 Cross lode—and this of itself is too small to mean much to the company. The rest of the ore in sight is in small bunches, on the fringes of the old chutes. These are not likely to lead to anything. On ore now in sight and including also the company's large cash reserve, the shares have a speculative value of £1.

value of the shares.

Kalgurli. (Issued capital, 120,000 £1 shares.)

The **Kalgurli**, adjoining Associated, is another disappointing mine, but not entirely so. The first two levels have a lot of good ore. Below that the chute converges into a mere pipe, and for five levels, down to 850 feet—the present bottom of the mine—is hardly over 100 feet long. But the width of this ore runs up to 10 or 15 feet, and as there is payable ore on each level the total amount in sight is considerable.

Shares are worth £3.

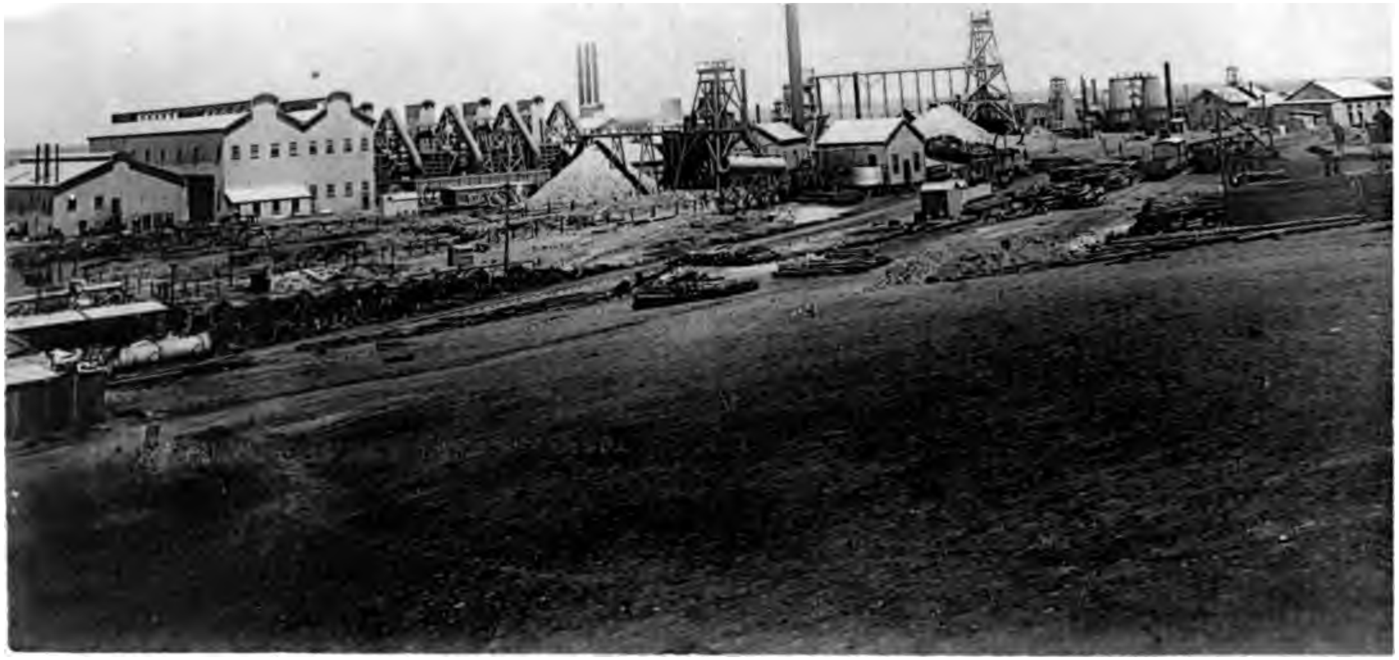
The shortness of the ore chute is a bad feature. One never knows at which level it may give out. Fortunately the company has a small capital. At £3 for the shares, the value of the mine is £360,000. I think that the ore in sight will yield a profit of £250,000, which is moderately good security for a valuation of £3 a share. But of course the mine cannot be classed as one with assured prospects.

South Kalgurli. (Issued capital, 120,000 £1 shares.)

South Kalgurli. It is officially stated that this mine is likely to earn a profit of £6,375 a month. That is to say, it will treat 3,000 tons at a cost of 35s. a ton, and recover 77s. 6d. a ton. We shall see. The compiler of that report is an optimist. If the mine earns half this amount it will do well. So far payable ore has been found down to 700 feet, but there is not a big enough stretch of it to place the mine on a sound basis.

Associated Northern Blocks.

Associated Northern Blocks. This is a newer mine than the others; it has only been opened in the last three years. It



GREAT BOULDER PERSEVERANCE. SURFACE PLANT.

lies on the east zone of reefs which have proved the most treacherous in depth. The question is, can this mine be expected not to go wrong in the same way as the others, when its levels reach to say 500 or 600 feet? A lot of good ore has certainly been exposed, but I doubt if the mine is so good as its owners think it to be. It is misleading to be guided by the value of picked parcels of ore that are sent to the smelter. It is difficult as yet to place any definite valuation on the shares.

Hannan's Brownhill. (Issued capital, 155,000 £1 shares.)

Hannan's Brownhill.—I am afraid this mine is in a doubtful condition. Below the 5th level there has been practically no ore at all. In August, 1901, the manager announced that ore had been found on the 7th level. If this proves a permanent body it will quite alter the mine's future, but the conditions—as seen in the lowest levels of the other mines along this eastern zone—are not favourable. I cannot see that the shares are worth buying at all.

I would suggest that the Hannan's Brownhill, Northern Blocks, and Oroya amalgamate. The first-named has, I think, little ore, but it has a fine plant. The other two have some good ore, but not so much as is commonly supposed.

This closes the list of the big producing mines. It is certain that most of these cannot continue their present yield for long. There must be a falling-off. The smaller mines of the field, that is to say those which are struggling along on small patches of ore, have now been fairly well explored, and found wanting. I cannot decide in my own mind that even *one* of these mines has in it ore of real value.

Boulder Main Reef.

Boulder Main Reef appears to be getting to the bottom of its ore chute; this was only 170 feet long at the surface. As that part of the chute inside of the Great Boulder boundary—worked by the Lane shaft—gave out at about 300 feet, it is rather surprising to find how far down it has lasted in the Boulder Main Reef. But the natural dip of the chute was of course in that direction. This has been a carefully-worked little mine, although ridiculously over-capitalised, but now I am afraid its days are numbered. This was the first mine on the field to treat sulphide ore successfully.

Hannan's Star.

Hannan's Star, the next mine to the south, has a run of ore that is just unpayable. The margin is so narrow that by omitting development costs and depreciation, a small monthly profit could perhaps be shown. But at the end of the year, when the accounts had to be made up, this sophistry would have to give way to hard facts. I cannot attach any real value to this mine.

Great Boulder South.

Great Boulder South, so far as I know, is no good. It is strange that the shares stand so high.

Golden Link.

Golden Link, a mine that for years had the best chances of picking up the extension in depth of the Lake View chute, must now, I think, be classed as a failure. The Lake View ore apparently dies out altogether before reaching the Golden Link boundary. Boreholes and extensive drivings at the different Golden Link levels have located no permanent ore body. The company ought still to have a big cash balance, which may serve to continue explorations, or to buy a mine in one of the northern districts.

Hainault.

Hainault I judge to be a mine that will earn a small profit for a year or two, in treating oxidised ore, but when the low grade sulphide zone is reached, the profit will vanish. I, therefore, do not think much of its chances.

Central and West Boulder.

Central and West Boulder shows no payable ore.

Hannan's Oroya.

Hannan's Oroya.—This mine has two leases. In the southern one it has a tail end of the Australia East lode, coming in from Associated. This dies out in depth leaving only a small tonnage of payable ore, of no big value. The north lease lies contiguous to the Northern Blocks mine, and may possibly get some extension of the good ore being found in that mine. Here there are chances for the Oroya, but I do not look for any permanent profits.

Brownhi
Extende

Brownhill Extended.—A lens of rich ore was found in the south end of Hannan's Brownhill. This extends into Associated Northern Blocks and passes through the north-west corner of the Brownhill Extended. It is only found in this one corner—and its area is known with accuracy. Fortunately the lode here is wide, and also rich. This gives Brownhill Extended an asset of possibly 8,000 tons of rich ore. I know of nothing else in the mine worth taking into account. I suppose this ore should yield a profit of several shillings a share.

Crœsus
United.

Crœsus South United.—This is a mine only so long as the oxidised ore lasts. It is low grade, but may yield a profit. Certainly the sulphide ore will not.

Hannan'
Reward.
Hannan'
Propriet

Of **Hannan's Reward and Hannan's Proprietary** I know nothing hopeful. They produce a little gold irregularly, but do not make any profit.

Once upon a time, in describing the mines of the Kalgoorlie field, one could have referred to the chances of success for such mines as **Lake View South, North Kalgurli, Brownhill Central, Paringa, North Boulder, Chaffers,** and **Great Boulder No. 1.** I am afraid all of these mines are now proved valueless. Most of them are now shut down.

Of the outside districts for which Kalgoorlie is the centre, one can only say that their position is no worse than it was three years ago.

Kanown
district.
White
Feather

Robinso

At Kanowna, indeed, there is some improvement. Besides the **White Feather Main Reef** and **North White Feather**, which have increased their yields, several other small mines look rather promising. The **Robinson,** after being shut down for a time, is to be opened again.

Of course this class of mine is not for the investor, and only for the rank speculator. But one is always glad to note the energy put into such undertakings. Here and there a small hand-to-mouth mine one day opens up into a big property. In any case the output swells the State's gross yield, and gives employment to a number of men.

At Bulong is the patchy **Queen Margaret** mine.

Broad Arrow district. Paddington Consols.

At Broad Arrow is a well-known mine that may some day be worked at a profit—**Paddington Consols.** The original company was liquidated. It then became one of the assets of the Standard Exploration Company—also liquidated. This is a biggish free milling reef yielding about 30s. a ton. There is a good water supply.

Hill End.

The well-worked **Hill End** mine, belonging to the New Austral Company, located in this neighbourhood, is now, I suppose, worked out.

Golden Arrow.

The **Golden Arrow** mine produces a little gold. At 25 miles the **Premier** mine, a local company, pays small dividends. The next district to the north is Menzies—80 miles from Kalgoorlie.

Menzies district.

Menzies is over 450 miles inland from Fremantle and Perth, and is the terminus of the railway. From here several branch lines to mining districts within 100 miles of this centre are urgently called for.

Conditions at Menzies. Short chutes, hard rock, and scarcity of water.

The reefs at Menzies are of a bluish quartz lying in a regular but exceptionally hard rock formation. The gold is found in chutes, but the experience of the last three years has been that they cannot be relied on at a depth. Another drawback is scarcity of water. This is more apparent than at Coolgardie or Kalgoorlie. A local water company earns small dividends by pumping to the mines from a so-called lake some miles distant. The rate used to be 25s. per 1,000 gallons for a water thick with salt!

Lady Shenton mine.

Menzies is best known through the **Lady Shenton** mine – a property which, working under difficulties, has paid about £100,000 in dividends. Three years ago I examined the mine carefully. It was then a good mine. Since then it has materially fallen off. It is the old story – the chute going wrong in depth. Still, I do not suppose the mine is worked out yet.

Florence.

Menzies Alpha.

A small portion of the chute, only a corner, runs through the **Florence** mine. On the other side of the Shenton, again, part of the chute may be found in **Menzies Alpha.**

London and Coolgardie Explorers.

I would advise an amalgamation of these three mines, adding, if possible, the dip claims belonging to the **London and Coolgardie Explorers** and other owners. The amalgamated company could only stand a small nominal capital, but I think it is just possible that good ore might be found in one or other of the combined leases. The problem is purely speculative.

Queensland Menzies.

The **Queensland Menzies** on a narrow but rich chute of ore continues to pay dividends. I am surprised this small mine has lasted as it has done.

Menzies Consolidated.

Four miles distant is the **Menzies Consolidated,** a mine with a good water supply, which yields about 500 ozs. a month at practically no profit. Of late the yield has been a little higher than this ; it may mean a small profit.

The other mines on this belt have either all been liquidated or are in course of being so. There were 29 English flotations in this district.

The great go belts in the North !

But it is beyond Menzies, in the great stretch of desert to the north, that, to my mind, the real future of West Australian gold mining lies. Over an area 500 miles long and perhaps 300 wide, are scattered nearly 20 mines now working at a profit ; a few more are being opened up with fair prospects. All of these mines represent a newer era than the Coolgardie, Kalgoorlie, and other southern fields. On the whole, they have been, too, more capably and honestly handled than these older mines. All of these mines will not be permanent producers, but most of them will yield gold, with at least a small profit, for some years. But several are big mines—the sort of mines that attract capital and enterprise to a country. Then, too, allowance must be made for the prospects now being developed, and for future finds. This is the part of West Australia that would attract me—that ought to attract any one looking for a mine to float.

Mount Margaret, Mount Malcolm, Mount Leonora, and Niagara.

I will take first the area enclosing the Mount Margare Mount Malcolm, Mount Leonora, and Niagara districts. Ther are here at least 15 mines worth noticing. Of these:

Sons of Gwalia (Issued capital, 343,000 £1 shares):

Sons of Gwalia is the best. When I saw this mine the shaft was 200 feet deep. Now it is reported to be 810 feet. The chute of ore is still of good value at the lowest point.

I believe this to be a permanent mine. Of course there is not enough ore opened up to place the mine on a really sound basis, but this probably could be done. The report lately issued shows development work to have been much neglected.

It is a free-milling ore, cheaply worked, and there is a good water supply. In the early days the ore was picked, and for a year after the big mill started—to recover the average—poorer ore had to be treated. Crushings have now been brought up to a fair average of the ore in sight.

its possibilities.

This mine has possibilities of soundness, and I advise the directors to hasten on mine development, even to the partial detriment of present dividends. This is *the* one and only policy of scientific mining. It is the best one in the long run for shareholders, and for the cheaper working of the mine. I believe that in two years, if thus rapidly opened up, the Sons of Gwalia would change to a more settled basis of valuation.

The small mines adjoining the Gwalia are no good.

Cosmopolitan. (Issued capital, 370,000 £1 shares.)

Cosmopolitan.—This mine, on ore in sight, will earn good profits for some years. As to whether it is a permanent mine in depth can only be found out by rapid development Here, again, the directors should take money from the profits, and put it into extra development. This, too, is a mine that has a chance of permanence. If people are to buy the shares from the big holders, let them have every chance given them to show that what they are asked to buy, has, at least, the elements of permanence.

Westralia Mount Morgans.

Westralia Mount Morgans is said to be a good mine. I have not seen it; but let the same remark apply here. A permanent mine is a great its owners.

Merton's Reward.

A rich, privately-owned mine in this district, is **Merton's Reward.** The workings are yet in the oxidised ore body, close to the surface. They may not go down; if they do it will produce largely.

Euro, Ida H., Guests, Golden Rhine Craiggiemore, Britannia, Mount Malcolm, Mount Margaret Reward, North Star.

Other gold producers in this district, some of which are promising, are: **Euro, Ida H., Guests, Golden Rhine, Craiggiemore, Britannia, Mount Malcolm, Mount Margaret Reward,** and **North Star.** All of these are prospective only. The shares as yet are gambling counters. If profits are earned let the directors apply them to extra mine development—not to dividends. Dividends from a small hand-to-mouth mine encourage market gambling. Mine development is the scientific step to take. It gives the mine—as a mine—the best chance in the long run.

East Murchison United.

The next district, going north, is Lawlers. Here is located the **East Murchison United.** At present the lower levels show that the ore chutes are dying out. This mine in the past has earned good profits, and seems to have been well handled.

Bellevue.

Near here is the **Bellevue Consolidated**—still a problematical property—but I believe it will turn out payable.

Lake Way mines.

Far away out to the east from here are the **Lake Way** and **Golden Age** mines. They, too, are as yet problematical.

Cue.

Two hundred miles north of Lawlers lies Cue—the centre of the Murchison district. There is a railway to Cue, 300 miles inland, from the port of Geraldton.

The Murchison district: its prospects.

I have inspected the Murchison since writing the first edition of this book. What I saw surprised me. I had thought the district had no hopes and no ore; but I saw that it has hopes, because there are literally hundreds of reefs there—many of which carry gold. I saw, too, within four miles of Cue, the Great Fingall, which is the best gold mine opened up anywhere in the last eight years.

Let us take Cue as the centre from which to start on a prospecting trip. Within ten miles of it, on all sides, the outcrops of hundreds of white quartz reefs can be seen. In the early rush

Reefs near Cue :

these should be actively prospected.

to the district, when some seventy English companies were floated in the Murchison, many of these reefs were taken up. Some of the companies frittered their money away in buying stamp mills and machinery ; others did a little development work, and then came to the end of their cash ; and others simply had their money stolen from them under false pretexts. It is quite certain that even this small area, within ten miles of Cue, has never been properly exploited. And yet in this area, only unearthed accidentally, so to speak, is the Great Fingall reef. What if there should be even one more ore chute as good as this, or perhaps four or five, which together equalled it in value? It would justify the spending of half-a-million sterling in this ten mile area in the hopes of finding these.

Any company floated to exploit this Cue field, with a sufficient working capital to explore one or two of these reefs exhaustively, would be a legitimate venture. Of course, if it were saddled with a big watered stock – the price for the properties taken up—as a beginning, it would not be a legitimate venture, because to-day these reefs can mostly be had for the pegging-out. Further afield, outside this central area, there are opportunities to spend money wisely in exploration, but here, again, there must be no watered stock.

Mining facilities of Murchison district : railway, fuel, fresh water, free ore, labour supply.

The Murchison field has advantages for cheap mining. There is the railway already at Cue. Mining fuel is cut further down the line and supplied at a reasonable figure. Still more important is the good supply of fresh water found in all the shafts. The ore is free milling, and a good extraction is got by ordinary milling and cyaniding. The labour supply is mainly Italian, and fairly good.

I cannot believe that the Fingall is the only payable mine, even in this immediate Cue area. Other discoveries may be expected within a year or two. A lot of small mines, or mines being worked in a small way by syndicates of working-men, are at work. These mines use the batteries put up in the earlier days, for which no ore was opened up. Some of these small mines on tion may be found worth active exploration.

Great Fing
(Issued
capital,
124,061
£1 shares.)

Great Fingall, under the names of the Day Dawn, and then the Consolidated Murchison—one of the original Murchison flotations—never earned profits. And yet it had a big reef, milling 10 dwts., and a strong ore chute; so those in charge of the mine felt that, although not earning profits, it was worth more than actual results seemed to show.

A wonderf
improveme
at 400 feet
deep!

These conditions lasted to 400 feet deep—the fourth level—at which point there was a strange improvement. A branch reef joined into the main lode here, and it is assumed that this junction caused the change. Personally, I am no believer in theories of this sort. In any case the reef was 15 feet wide on the fourth level, of high value, and the chute was a long one. The shaft was sunk 100 feet, and a cross-cut driven out to the lode. Here, at 500 feet, it was just as good, and as wide, and subsequent driving along the lode showed the chute to be even longer than at 400 feet.

Rich ore a
of great siz
continues t
present
bottom of
mine!

Another hundred feet was sunk. The sixth level was proved as good as the fifth. And then the seventh level was opened. The reef was still as good as ever.

I saw the mine in March, 1901. Already the seventh level had been driven over 200 feet—showing a big reef in each end. The average width was about 15 feet! I saw here as fine a purely quartz reef as I have ever seen in my life. It is a rich blue quartz, highly mineralised, perfectly defined—as from the country rock—and lying between walls that are clear cut. The dip is 65 degrees; the width is 15 feet; and the average value over £6 a ton!

Since then this seventh level has been continued—I suppose to the limits of the ore chute. Apparently the length of the chute, as defined by the several levels, is 600 feet.

The reef at the eighth level has now been opened. It seems to be just as good as elsewhere!

Working
costs.

The ore is a free milling one; the mine produces fresh water, and the railway to Cue—four miles beyond—runs within a quarter of a mile of the main shaft. Working expenses with a big mill will be 30s. a ton.

The quantity of ore on each level of the Great Fingall—assuming the chute to be 600 feet long, and the width 14 feet—is

Ore in sight : 60,000 tons. From the eighth level, to a short distance above the fourth, where the good ore commences, there is a total of 250,000 tons. Deduct from this 50,000, for ore treated up to the spring of 1902—leaving 200,000 tons.

its value.

The average value of this is £6 a ton, delivered in the mill. The profit is £4 10s. a ton, therefore the total profit in sight on the 200,000 tons is £900,000. I feel sure that this estimate is correct. This is equal to over £7 per original share profit in sight. There is as yet no sign of the chute giving out. Each level of 100 feet that it continues means a profit of £2 a share. To all this must be added the company's substantial holding in other mines—23,276 shares in Sons of Gwalia, and 87,500 shares in West Fingall.

Prospects for the future.

As yet, as I have said, there is no sign of the chute dying out. But of course a mine is at its best at one spot or other, and from there it begins to get poorer. Shareholders have here, by mere chance, too, a great mine—I believe the best mine in West Australia—but it will not do to lose their heads over it. Let development be rushed on, with the view not of increasing the 60 stamps, but giving them steady employment for years, and putting the mine on an absolutely sound basis. If developments even prove the chute to last down to 1,200 feet, it means many years of steady profit ahead.

West Fingall.

West Fingall. This adjoining property has several reefs which dip at varying angles, and it is hoped that a junction of these may occur at 600 or 800 feet, resulting in an improved value for the master lode of the series. I do not believe in these sorts of theories. At the same time it is good policy to sink first, and then open up at depth, not to grub about on these reefs near the surface.

I can only see a speculation in West Fingall—nothing like a certainty. It will be some years before anything much can be proved, one way or the other. The expenditure of course is a legitimate one, as the reefs are known to be fairly good in places.

Both these mines are well managed.

Fingall Reefs Extended.

The **Fingall Reefs Extended** is producing gold; it is thought this mine may eventually pay.

On the fringes of the Murchison district are Nannine and Peak Hill to the north-east, and Mount Magnet on the west.

Nannine.

The **Nannine** mines and **Mount Yahagong** are small producers.

Peak Hill.

The **Peak Hill** is apparently a mine that may work for years to come at a profit, as the ore body—a series of small quartz veins running through the mass—is large. But this is peculiarly the kind of mine difficult to value, and as I have not seen it, I can say nothing definite about it.

The **Horseshoe (Peak Hill)** I believe is poor.

Mount Magnet. Long Reef.

At Mount Magnet is the **Long Reef;** a small mine, but the ore chutes are still holding out. It is worked at a profit, but of course there is not ore in sight at all commensurate with the market value. This is as well managed a mine as I have seen in Australia.

Morning Star.

Near here is the **Morning Star,** a locally-owned mine. If capital were put into this property I believe it could be made to pay. At present, although it has turned out a lot of gold, and paid for its plant, the work is on a hand-to-mouth scale.

Conclusion. A summary of the best mines.

Such is the West Australia of to-day. As far as one can see, the mines that have the best guarantees for permanence are:—

Great Boulder,
Ivanhoe,
Golden Horseshoe,
Boulder Perseverance,
Great Fingall.

Others may come to the front; but to prophesy in mining is risky.

The one thing for directors and shareholders to realise is this. Go on developing; never mind about dividends yet. To exp more ore is the best guarantee for cheap working and ever profits. It gives the mine the best chance in the long run.

CHAPTER V.

THE GOLD MINES OF VICTORIA.

Gold yield of Victoria.

SINCE gold was first discovered in Victoria, in 1851, the total yield is officially stated to have been about 263 millions sterling. In addition to this a great quantity is thought to have been taken away by early diggers, principally Chinese, who left no records of their finds. But in any case the official figures show that this State has yielded, next to California, more gold than any other in the world's history. For fifty years now there has been a large output; varying between 3,053,744 ozs. in 1856 and 576,399 ozs. in 1891. At present the yield is about 800,000 ozs. a year, equal to £3,200,000, and I see no reason why this yield should not be kept up for an indefinite period.

Yearly yield and dividends.

For the last few years dividends from public gold mining companies have averaged rather over £500,000, but as many of the mines are privately owned, and as all sorts of industries are indirectly supported through the gold mining, the benefit to the State is far more than this figure would seem to indicate. In fact, gold mining is still of first rate importance to Victoria, and no steps which the Government can take to support and purify the industry can be deemed more than what is justly due to it.

Future prospects.

Gold is found, in greater or less quantities, nearly all over Victoria. Many of the most valuable lines of reef in the older districts are now worked out, but every year new discoveries are made, or abandoned reefs are again taken up and worked at a profit. On the whole, I consider the future of the industry, as carried on in its present widespread way, is assured; and I even believe, despite the 260 millions already taken out of the ground, that with more scientific mining the yearly output could be greatly increased.

In brief, I believe that Victoria is still full of gold in an easily-won state; but its discovery, and its profitable winning, are retarded by an inefficient Government department, by a quite unscientific style of mining, and by market and financial matters that are too often dishonest in their nature.

Mining Districts

Mining Districts.—The principal mining district in the State is the wide mineral belt which has centres at such far apart places as Ararat, Ballarat, Maryborough, Castlemaine and Bendigo. In the north is a belt running through Beechworth and Rutherglen; and the whole of the great Gippsland district, in the East of the State, although only partially prospected, carries gold throughout. Here and there, in the remaining portions of the country, gold is worked, but not to any great extent.

Varietie ore.

In all these deposits there is considerable variety. White low-grade quartz containing free gold is commonly found; but in Gippsland and elsewhere the ore is refractory and base and often of high value. In other districts the alluvial deep leads are worked, and river dredging and hydraulic sluicing have of late years been tried in a number of places.

Englis capital.

English capital is not sunk to any extent in Victorian mines. The reason for this is that local mining men will not part with a good mine, even at its full value, and a few purchases of worked-out properties have somewhat damped British enthusiasm. Local capital from Melbourne, or Ballarat, or Bendigo can generally be scraped together to put a really promising mine on its legs, but never to give it the ample working capital which must be spent on any mine before it can really do itself justice, and in this respect probably every property floated in Victoria has suffered. The list of Victorian quartz mines controlled from London is a short one, and the individual mines are insignificant. In this respect an account of the mines of the State cannot have great interest for European investors, but it is with regard to the future, rather than to the present, that I would call attention. Of the group of English-floated Deep Lead Mines I will deal separately.

Primiti mining metho

Gold-mining in Victoria is carried on in a most primitive way. A want of suff [illegible] ing capital accounts for a good deal of this; but the most glaring faults—such as a complete lack of ore sampling and assaying, and no system of keeping cost sheets or analyses of expenditure—are inexcusable. There is slovenliness everywhere, and a great want of method. The Government should not tolerate this. If it employed a scientific mining engineer, with a trained staff, he would soon remedy matters; but the only officials in existence at present are State geologists, whose duties are not meant to embrace a system of ore sampling or the drawing up of an analysis of working costs.

No State Engineer.

Facts are ignored.

In truth, in mining in Victoria, there is a general disregard of facts. They are not insisted upon by the Government department, they are neglected by managers who neither assay their ore, nor calculate their reserves, nor work out their costs, and they are not expected by shareholders—who have not been educated to look for them. No science! no method! no facts! How can any industry progress on such lines? For example:—I visit a certain mine; I see the manager's office littered with papers and in general confusion. He takes me to an out-of-date mill which has absurdly light stamps, and which is fed by hand. He does not know the actual tonnage being crushed, but guesses at it. We go underground, and I note the absence of air compressor or rock drills. We see various blocks of ore; the manager does not know the amount in sight, nor its value, nor the cost of working it, nor how much a month he spends on development. He thinks that his working costs are so many *pennyweights* per ton—whatever that may mean. He admits that he is milling only the richest ore. Why is that? Well, the directors told him to work the mine so that they can pay 1s. a share dividend every month, and as he only gets £4 a week, and has a family to support, he cannot afford to quarrel with them. Does the Government take any interest in the mine? Yes, they sent a geologist, who told him his slate footwall was an amygdaloidal schist! Does the legal manager not keep cost sheets? No; he does not think so; at least, he has never been asked for details!—And so on. There is no exaggeration in this; the experience has happened to me over and over again. In Victoria it seems quite a natural state of affairs, but in the

An example of a badly managed mine.

Transvaal, say, or in India, managers, secretaries and directors who tolerated such chaos would very soon be sent about their business.

Mine managers:

Victorian mine managers, needless to say, are twenty years behind the times. They are usually drawn from the ranks of the working miners; being of superior intelligence, they work their way up as contractors and shift bosses to mine managers. But they are not educated men, and, being ignorant of, they are not susceptible to, the influences and methods of modern scientific mining. Nothing shows this more clearly than their hearty contempt for mine sampling and assaying. One would think that a shopkeeper who did not keep books, or take stock occasionally, would finally come to grief; but apparently they do not consider that a mine which is not valued regularly, both as to quality and quantity of ore, is in an analogous position. The manager's idea of an assay is too often a little bit of stone carefully picked from the richest portion of the reef. The result from this, generally ridiculously high, is published as representing, perhaps, the supposed average value of some new discovery; unwarranted estimates of the value of the ore are made, and later on everyone is hugely deceived. This want of mine sampling is, in fact, ridiculous; and of course speculators in these mines have to put up with a minimum of security.

they despise assaying,

with disastrous results;

Every now and then some mine, hitherto paying regular dividends, suddenly goes wrong. People shake their heads and talk of the uncertainty and danger of mining. This is an injustice, because if the mine had been properly sampled, the lower value of the ore would have been discovered long before, and shareholders would have been prepared accordingly. The fault lies not with the mine but with its bad management, and with the shareholders and directors who tolerate it.

qualities in their favour.

In defence of Victorian mine managers, I must say that I found them frequently to be men of character; hard working, and invariably courteous to a visitor. Their actual mining work is often well done. But they are miserably paid; they are at the mercy of directors who ask for no higher style of work, and of shareholders who take interest only in the gambling side of mining. In other words, I suppose they are largely the victims of circumstances—'Every country gets the mine managers it deserves.'

Number of mines in Victoria.

There are probably in Victoria some 500 or 600 gold mining companies. Every week witnesses the flotation of perhaps one or two, and the demise of a similar number. Most of these are floated with a ridiculously small working capital, varying from about £500 to £3,000 or £4,000. Consequently, unless something of promise is discovered very early, the company comes to a natural end for want of funds. Further working capital is rarely provided unless the prospects of the mine are favourable.

The 'no liability' law: its operation.

Nearly all these companies are floated under the 'no-liability' law, and these words are added to the name of the company in documents, as, for example, The South New Moon Gold Mining Company No Liability. Sometimes the letters (N.L.) only are used. On the flotation of a no-liability company, a first call is made against the shares—of perhaps 2s. or 3s. only; the holder of this scrip, or any subsequent purchaser, may be called upon by the company at several weeks' notice to pay a further call, or a series of calls, until the full value of the share, which is usually for 10s. or £1, is paid up. Should the holder not be satisfied with the prospects of the mine, and therefore not anxious to pay the calls, he forfeits the shares; which revert to the company. If they have any market value the company sells them by auction, refunds itself the amount of the call due on them, and pays the rest to the forfeiter.

The 'call' system

This 'no-liability' system of flotation is sound enough in theory, but in practice it acts badly. To begin with, the working capitals provided are so small that in no case are they sufficient to bring the mine to a producing stage. This means that one or more 'calls' have to be made. If the mine is not promising well the shareholders do not pay the call, the mine is shut down, and the money already spent is wasted—whereas the mine may be all the time a good one, which would have disclosed its value had enough capital been put up originally to fully develop it. On the other hand, the mine may be in a promising condition and the shareholders pay the calls. But the call is for the absurd amount of only 1d. or 3d. a share a month, and the money so raised—perhaps £400 or £600—is only enough to do bare development work, and not enough to prove whether the mine has really possibilities beyond the ordinary ten or fifteen-stamp capacity which seems to satisfy local mining men. It seems quite certain, therefore, under the no-liability system, that many a mine in Victoria, scratched on the surface, has never yet seen the light at all, and many another, worked as a small and struggling property, has simply been strangled through weak finance, and never allowed to show its real capacity.

is a failure.

But the most glaring financial error, which I feel certain has cost the mines in Victoria hundreds of thousands, if not millions of pounds, is the hateful habit of immediately paying away as dividends every penny of profit earned by the mines, and making no provision for the future.

Company finance very weak:

I know of mines earning regular profits, at which the application of three or six months of these profits to the acquiring of labour-saving machinery, pumps, perhaps, or rock-drills, or crushers, or a new mill, or concentrating tables, or self-feeders, or the more active carrying on of mine development, would certainly result in the saving of several shillings a ton in costs. These improvements, in fact, would pay for themselves in a year. And yet so rotten is the finance of these mines that the directors are allowed to pay the profits away in monthly dividends, and their mine still stands thirty years behind the time in equipment. I would suggest that the shareholders in every profit-paying mine in Victoria instruct the directors to set aside, before paying another dividend, the sum of £2,000, to act as a fixed reserve fund in case of necessity. I remember, speaking of this, once asking the director of a mine near Ballarat why he did not hold over the dividend for one month and buy a rock-breaker and self-feeders for the battery. He and his brother directors regarded me sadly for a while, as one tainted with revolutionary ideas; and then to put me out of suspense he gravely told me that the dividend could not be

its evil effects.

A Ballarat director.

stopped even for one month; and secondly, that stone-crushers and self-feeders were no good, *because he knew a mine in Ballarat which had introduced them and yet never paid a dividend at all.*

Mining facilities in Victoria.

Another reason why the mining industry in Victoria should be raised to a better level, is that the facilities there for cheap mining and treatment of quartz are almost unrivalled. Firstly, there is a temperate climate; and in most of the mining districts water, fuel, and mining timber are plentiful. Nearly all the mining centres are connected by railway, and excellent mining machinery, made at several towns in the State, can be landed close to many of the mines. To this must be added a particularly cheap scale of living. As to the ore itself, it is generally easy to mine; it is in most cases easily treated by stamping and concentration. The gold is so free that no after treatment of tailings is needed, and the standard of fineness, bullion often going up to 82s. an ounce, is the highest known. Another good feature is the modest scale of fees paid to secretaries (or legal managers) and directors. This long list of helps to cheap mining, if considered carefully, cannot but appeal strongly to mining men; indeed, in the face of such, it is surprising that costs should be so high as they are.

White labour.

The only other item is that of white labour. In none of the Australian States is black labour allowed underground, and the wage to white miners, who are all banded into strong labour unions, is a substantial one. In Victoria, the rate of pay in the principal mining districts is 7s. 6d. a day of eight hours, or £2 5s. a week. In certain parts it is £2 10s., and for driving or sinking in wet or hot ground, this latter sum would also be paid. The Australian miner is usually an excellent workman, but the teaching of the labour union is that one man shall not do more work than another, and consequently we find that the standard of work adopted is that of the worst and feeblest workers. Contract work is occasionally demanded of the men, more especially in the alluvial deep lead mines, but it is easy to see that any style of work by which the brainier, better-equipped man is likely to benefit over the feeble weed or drunkard, does not find favour with the unions. On the whole there is not much contract work; in this respect mining in Victoria is centuries behind the Transvaal, India, or the United States, and in the moderate standard of its day labour, mining men in the State have to face almost their only drawback.

The Australian miner:

If the Australian miner, who is usually fitted with strong muscles and a shrewd head, would do his work regularly on contract, he could comfortably earn £150 a year, and at the age of 30, he might have £500 in the bank. As a matter of fact, we find that he in his labour union fights against the contract system; he prefers a low standard of work, and a smaller wage; he often spends every penny of his surplus earnings in drink; in time frequently becomes degraded to the level of the beasts of the field, and his dying breath is a curse against capital, which he assumes has brought him to his present unhappy condition.

drink is his curse.

The exception to this rises to be a shift boss, or mine manager, and if he does not drink, is enabled to save a considerable sum against his old age.

Nature of the reefs.

Of course it must not be understood that facilities for working the reefs include regularity in size, continuance in depth, and value of the lodes themselves. The gold reefs in Victoria are usually of a milky-white quartz, and, taken all in all, they prove themselves as treacherous to handle as white quartz veins in any other part of the world. Here and there a chute of ore has continued payable down to 2,000 feet, or even to a greater depth, and the present workings of some of the best mines in the Colony are at from 800 to 1,500 feet; but on the whole there is only one criterion for judging these reefs—viz., to expect that at any moment the chute will come to an end, and to allow for not a single ton of ore beyond what is actually in sight.

Often treacherous in occurrence.

The reefs are of all sorts. Many, including some that are particularly rich, are merely gash veins, which die out at 100 or 200 feet. A great number appear to survive this depth, but go seriously wrong at about 500 feet. Some of the lodes are very wide, but correspondingly of short lateral extent, and as these usually dip obliquely, they might almost be classified as flat reefs. They, too, rarely go down far. On the whole, we may assume that, although they may yield handsome profits in the meantime, most of the reefs in Victoria do not penetrate to a great depth. Every here and there is found a lode that goes to 2,000 or 3,000 feet, and carries payable gold, and the peculiar saddle reefs of Bendigo have been worked to even a greater depth.

Nature of the gold.

The gold is generally found in splashes of mineral, or it can be seen in specks agai he white quartz; it is mostly free, and of a high standard of f ess. Unless from the refractory reefs of Gippsland, the battery ches the bulk of it. The remainder is caught on blanketi or Wilfley tables, and in rarer cases the tailings are treated by cyanide.

Yearly gold yield of Victoria

The total yearly yield of gold in Victoria, at the moment of writing this, is equal to about 800,000 ozs. This can be analysed as follows:—

from quartz,	From mill, concentrates, and cyaniding (equal to a yield of about 46s. per ton treated)	say 600,000 ozs.
from alluvial.	From alluvial digging, 'deep leads,' dredging and sluicing . . .	say 200,000 ozs.

The quartz-mining districts.

Bendigo.

The most important quartz mining district in Victoria is, and has always been, Bendigo. Here the reefs are found in the peculiar saddle formations, and they on the whole have proved more reliable in their occurrence, and more profitable to work, than any other reefs in the State. The district has been worked for so long that many of the best mines have been worked out, but the yearly yield is still about 160,000 ozs.

The 'saddle reefs.'

The accompanying photograph which I take from a Government mining report on the field, explains the nature of a saddle reef better than a page of words. I will merely add that there are a number of parallel lines of 'saddles' on the field, and that the reefs lie under one another, saddle upon saddle, to a greater than any workings here yet penetrated. Already there are seven shafts sunk to below 3,000 feet. In one mine, the **New Consolidated,** I went down to a d

this was the deepest gold mine in the world; but the workings of the Jupiter and Simmer West Mines at Johannesburg are now deeper. At this depth of 3,550 feet, which was at the bottom of a 500 feet winze, the temperature of the air was 90°, and of the water which was falling into the winze 91°. There was a large reef exposed, of dull white quartz, but carrying no gold; indeed for 1,000 feet above this, in this same mine, no payable ore had been found, and shortly after my visit sinking was discontinued. This leads up to the statement that the Bendigo saddle reefs lose their gold in depth. Down to 2,000 feet most of the saddles appear to have yielded payable ore. Below 2,000 feet only here and there has good ore been found. One mine, the **New Chum Railway,** worked a good saddle at, I believe, 2,800 feet, but this is quite exceptional. The reefs themselves, I have already said, continue down to an unknown depth.

Deepest gold mine in the world.

Gold dies out below 2,000 feet.

The future of the field, lies in exploring some of the outside and hitherto little known saddle formations, principally those in the direction of Eaglehawk; in which it is thought that good ore will be found at a depth of from 1,200 to 2,000 feet. In this part of the field, too, the lodes are found of greater width, and can be worked on a larger and more regular scale. In Bendigo itself the 'New Chum' line of reef has been the most actively worked, and it is on this line that all the deepest shafts have been sunk. The yield of gold from the mines along this line is now small.

New lines of reef should be explored.

'New Chum' line of reef.

On the Garden Gully line there is not much animation except in the **Garden Gully** mine. This mine has had a great career, and has already paid dividends to the tune of £850,000. The saddle that was being worked when I visited the mine, was lying at the comparatively shallow depth of 900 feet. Previously, the Company had been working on lower grade ore at about 2,000 feet, but in doing some prospecting work on the upper levels came upon this rich saddle. I use this fact to again emphasise my opinion that in the older Bendigo mines it is more profitable to re-prospect ground at, say, 800 to 1,500 feet deep, than to continue sinking below 2,500 feet.

Garden Gully line.

Hustler's line.

On the Hustler's line, most of the mines are as yet unworked to a great depth, and I saw several with nice bodies of ore. The **Hustler's No. 1** and **Fortuna Hustler's** seem to have good futures.

It is unnecessary to specify the numerous mines on the field, as in rare instances only are outsiders interested in them; but probably the most promising mine in Bendigo at present is the **Clarence.** I did not inspect the **Koch's Pioneer,** or the **Goldfields of Victoria,** in both of which English capital is invested.

Clarence.

New Moon.

Reverting to the Eaglehawk district, I saw the great ore bodies in the adjoining New Moon and South New Moon mines, and I think these mines have many years work before them. The ore is free milling, but low grade. My enthusiasm was damped, however, when I found that no assays were taken, and that the respective managers could not tell me definitely whether certain great blocks of ore which were developed, and which were known to be of lower grade than the average, were actually payable or unpayable.

Workingcosts.

The **New Moon Mine** is well equipped on the surface. An analysis of results—not prepared by the Company, but extracted by myself from a recent balance sheet—for a six-monthly period—is as follows:—

Tons treated . . 14,454.					
Yield per ton			£1	6	8
Costs.—Mining, including development	s. 10	d. 6			
Milling	3	4			
Office and Management .	0	5			
Capital Expenditure on Machinery . . .	3	0			
Profit per ton . . .	9	5			
			£1	6	8

If the very large reserves of ore in the mine yield an average of £1 a ton, it can easily be seen that the New Moon mine would have a good future, but it is unsafe to estimate the value of any mine which is not regularly sampled.

South New Moon.

The **South New Moon** has, perhaps, even bigger ore bodies, but of lower value. The estimates of the value by the management are hazy in the extreme. When the mine is in full mining order, total costs should be about 15s. a ton, and in the meantime the yield is about 25s.—Since I wrote this the mine has come upon a body of much richer ore.

Beyond these mines, going away from Bendigo, little prospecting work has been done. Several deep shafts should certainly be sunk on the continuation of the New Moon line, and in course of time the mining centre of gravity of the Bendigo field is likely to shift to this locality.

The main gold belt of Victoria.

As I said before, the Bendigo field stands as one point in the main gold carrying belt of Victoria. Many lines of reef worked in different places in this belt have been already nearly exhausted; for instance those at Ararat, Ballarat, Clunes, Stawell, Daylesford, and Castlemaine. I am not prepared to say that these districts are worked out, because new mines are always being opened up, or abandoned reefs again prospected—sometimes with good results—but I suppose that the best ore has already been taken out. Here and there is an exception—a good mine earning regular profits—and as I inspected all of these I may now briefly refer to them.

Lord Nelson mine

At St. Arnaud, a point on the N.W. of the gold belt, there is the **Lord Nelson** mine, which up to date has paid nearly £200,000 in dividends. The present workings are at 1,400 feet; at that point is a fine lode, lying in several sections, but going strongly underfoot; it is probably 10 feet wide, and the length of the payable chute is given as 700 feet. There is payable ore developed for about three years' work above the 1,410 feet level. There are 40 stamps which crush 1,850 tons a month, yielding about 55s. a ton; the usual monthly dividend is 1s. a share, absorbing £1,800. If the reef lives in depth, as I think i it will pass out of the property of the Lord Nelson into t the **Lord Nelson North** at about 2,000 feet vertical. The

Nelson [illegible]rth has already got its shaft down to 1,400 feet, and if the outcrop company can secure this property at a reasonable price it would be judicious to do so.

One or two other mines are at work at St. Arnaud, but with poor results.

Stuart Mill district.

From here I drove through the gum trees for about 15 miles to Stuart Mill, where there are several reefs that were once worked profitably by small syndicates, and then abandoned when water level was re[illegible]he prospects are good enough to warrant the sinki[illegible]l shafts here, which would prove the downward co[illegible]f these lodes. Near here is the mining hamlet of R[illegible] with numerous reefs in the neighbourhood. One of th[illegible] **Pyrenees,** has been resuscitated, after being worked do[illegible] to water level thirty years ago and abandoned, and [illegible]ars to have rather good prospects. Another mine here [illegible] the **Surprise,** controlled by English capital, but which has [illegible]rned out a failure in depth. At Dunolly, not far from here, is the **Mother O'Gold** mine, owned by English holders. I believe that this mine is not payable.

Redbank.

The Pyrenees mine.

Surprise mine.

Mother O'Gold.

Maldon district.

South German.

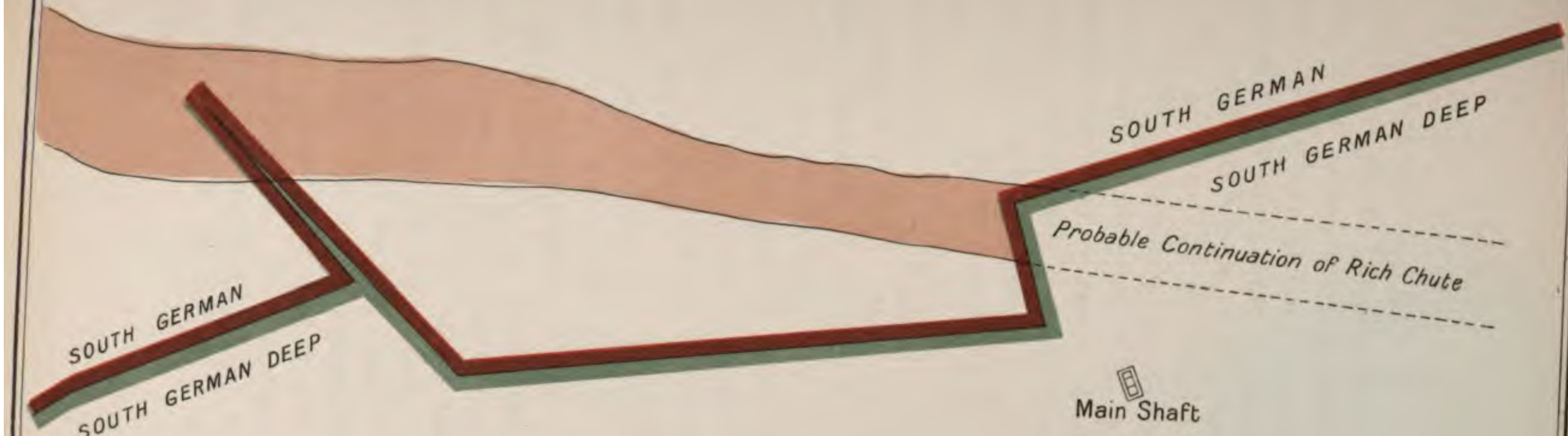
In the heart of the gold belt is the Maldon district. Here is situated the **South German** mine, till recently the biggest monthly gold producer in Victoria. This mine, to the end of 1900, had treated 121,000 tons for a yield of about 90s. a ton, and had paid £326,000 to shareholders. The workings at the time of my visit were at 1,600 and 1,700 feet.

Jealousy between adjoining mines.

South German Deep.

Inspecting this property gave me an object lesson in the exceeding jealousy there often is between adjoining mines. The payable chute of ore in the South German is dipping very obliquely, and at about 1,800 feet—in other words at about 100 feet below the present bottom workings—it will have passed out of the South German into the **South German Deep.** It seems almost a certainty that this will happen, and it means that the South German is nearly worked out, and that the South German Deep has a probably big future. But the South German has a fine surface equipment, and is strong financially, while the South German Deep has no equipment and can hardly

—Scale: 120 feet to an Inch.—



Sketch shewing probable Continuation of South German Ore Chute into South German Deep. The South German Deep Shaft is not down far enough yet to prove this.

Amalgamation is imperative.

raise enough money to sink its shaft to the required depth. Scientific and economic mining imperatively demands an amalgamation between these two properties, and yet I found the directors of the South German refused to recognise the position, or to ask the shareholders to amalgamate, hoping that in the meantime they would starve the holders of the South German Deep into sacrificing their property. In the meantime, the older mine will be worked out, the new one will not be ready to commence working, and everybody concerned will fail to make the money that they otherwise might have made. This is called smart mining in Victoria, and, indeed, in other parts of the world; but mining men did this sort of thing in the Stone age, and thought it smart even then, so that we have really progressed not so very much.

South Germa Extended.

Maldon Goldfields.

Byron Reef.

On paper, this property of the South German Deep Syndicate is a first-class mining speculation. Next the South German is the **South German Extended.** I thought the reef in this mine too small and cut up to be profitable. There are a number of mines at Maldon which may pay to work, but as yet they have proved disappointing. Amongst these is the **Maldon Goldfields,** an English-owned property. Another English mine here—the **Smith's Reef**—I have no information about. Near Maldon is a promising property, the **Byron Reef.** This is another resuscitated mine which was worked down to water level many years ago, and abandoned. When I saw it, several levels were being driven, and the ore from these was being put through a 10-stamp mill, for a yield of over 90s. a ton. Of course no regular assays are taken, and the whole thing is therefore reduced to a pure gamble, but the mine certainly looked well.

Castlemaine district.

Francis Ormond.

Forest Creek.

At Castlemaine, where gold was first found in Victoria, one or two payable mines remain. One is the **Francis Ormond,** which is working a big low grade formation at 900 feet deep. The value is irregular, but payable at present. The neighbouring mine, the **Forest Creek (Victoria),** an English Company, is sinking to try their ground at a similar depth, but the shaft is a mile away from the Francis Ormond.

ing Gully.

I also inspected the **Spring Gully** mine, which has g flat reef apparently, and which began by working all the good ore out. That now being worked is barely payable. Of course, no samples are taken, or assay plans made of any of these mines, and the whole thing is full of risk to the outsider. Take, as an example, this Spring Gully mine. When I went to Victoria the yields were good, and the shares stood at over £3; when I left, the yields were dropping rapidly, and the shares were at 10s., sellers. The management expressed a pained surprise at the way the mine was turning out.

Ballarat district.

The mines in or around Ballarat are now barely self-supporting. Some of these, such as the **Band and Loch**, **Central Plateau**, and **South Star,** have been opened out to below 2,000 feet, but the large bodies of dull white quartz found at that depth are practically not profitable. The yield of gold from reefs in the immediate district may be placed at about 65,000 ozs. a year.

Berringa.

About 30 miles south of this is the Berringa field, where there are numerous reefs. Some of the smaller mines I visited in this district, such as the **Kangaroo** and **Birthday Tunnel,** appear to be of doubtful value, but several of the others are worth noticing.

Jubilee.

The **Jubilee** mine lately commenced crushing with 20 stamps, and at the time of writing this is paying regular dividends. The ore is well mineralised, yielding about 46s. a ton, and there is a fair quantity in sight. This mine might develop into a sound property.

Birthday.

The **Birthday** mine at Berringa has been a valuable one. When I first saw it there was a lot of good ore in sight; but, of course, no assays were taken, and the value of the ore being developed was guessed at in the usual slovenly way. Now the stopes have reached 500 feet, and as the yield has fallen off very much, this probably means that the payable ore is dying out.

South Birthday.

Next to this is the **South Birthday.** The same formation shows in this mine, but the Birthday chute of ore is not likely to be found here.

Pitfield district. **Glenfine South;** **its value.** **A 'saddle' reef.** **Method of working.**

Near Berringa, on the Pitfield Plains, an alluvial lead is being worked by a number of mines. In one of these mines, the **Glenfine South,** the alluvial workings about four years ago penetrated the cap of a big white quartz reef. On subsequent development this reef raised the Glenfine South to be the biggest producer in Victoria. The lode, so far as at present developed, is of great size, in places being 60 feet thick; some of it is worth as much as £4 a ton; there are nearly 100,000 tons of ore developed; and 40 stamps are now turning out about 3,000 ozs. of gold a month. The lode is a 'saddle' reef, apparently, like those at Bendigo, and in depth the two legs diverge rapidly. Reasoning on this fact I assume that the reef will not go very deep; but as the length of the saddle seems considerable the comparative permanence of the mine may not be seriously affected. The mine is being worked in the typical Victorian way: no regular samples—or plans showing ore reserves and values—only guesswork by the manager, and if some day there is a sudden collapse the shareholders must not blame the mine, but the rotten method of valuation which prevails.

Glenfine Consols

Another mine adjoining this, the **Glenfine Consols,** lately found a quartz reef below its alluvial workings, but I am not prepared to even guess at the value of this.

Ballarat market methods.

A great blot on all the mines of the Ballarat district, including those I have separately mentioned, is the reckless gambling which takes place in the shares. In many cases the fact that the mines' output is being worked to suit the Ballarat market operators, among which are often some of the directors of the mine in question, is most transparent. To me this appears downright rascality; but as local speculators do not appear to mind it, and as the press is silent as the grave, perhaps the fact is not worth mentioning.

Bethanga

In the north part of the Colony not much quartz mining is now going on. The principal mine here is the **Bethanga Goldfields,** owning a narrow though rich reef. The expenses of working, I am told, are so heavy, owing to local conditions, that no dividends are paid.

Gippsland district.

The mines scattered among the mountains and forests of Gippsland all conform in one respect. The ore is heavily mineralised and most refractory, and cost of treatment is high. There are no railways, so that the ore, which should be sent to a smelter, has to be treated locally. It is concentrated, and the concentrates are chlorinated; but this method is full of difficulties, and expenses are high.

Cassilis.

A typical mine of this sort is the **Cassilis.** Here is a valuable reef, apparently regular; but it is nearly solid mineral, and in concentration a part of the ore contents, which are given as worth £8 a ton, will doubtless escape. I liked the appearance of this mine, but am not blind to the difficulties of working it.

Walhalla.

Long Tunnel.

At the town of Walhalla, in the heart of the Gippsland forest, is the most celebrated mine Victoria has had—the **Long Tunnel.** The chute of ore worked by this and the adjoining **Long Tunnel Extended** has yielded gold worth about 3½ millions sterling, and a profit of about £1,800,000. The deepest workings in the Long Tunnel reach to nearly 3,000 feet from the outcrop of the reef.

Long Tunnel Extended.

An amalgamation necessary.

At present the chute of pay ore has dipped into the Extended ground; but, such is the conformation of the boundary line, it will again be found in depth, should it live, in the Long Tunnel. An amalgamation of these two properties is absolutely necessary. But of course the shareholders of the Extended, who see that their mine is now yielding profits, and that the Long Tunne
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Other mines in Gippsland of some promise are **Maude and Homeward Bound, New Loch Fyne,** and **Victor's Quartz.**

Golden Dyke: a curious formation.

The only other quartz mine in Victoria I shall refer to is the **Golden Dyke,** near Wandong, and that because of its curious formation. The 'dyke' is 60 feet thick, but does not carry the gold; every here and there a quartz reef cuts this at right angles, and when enclosed between the walls of the 'dyke' is gold bearing. In the quartz are found solid veins of antimony, up to several inches thick, and on these veins the most of the gold is found. The method of treatment is crushing without amalgamation, and immediate concentration by blanketings.

Alluvial mining.

In the early days of Victoria nearly all its gold output was derived from alluvial workings; and from this source the yield is still very considerable. Under the head of alluvial we may class all gold that is found on or just below the surface, and that won from deep leads and sluicing and dredging areas.

Deep leads:

The gold bearing 'deep leads,' which are really the beds of old rivers, have been worked out extensively where found at shallow depths; but where they lie deeper they have as yet been seldom worked, and hundreds of miles of these leads have been proved by boreholes. If they can be worked profitably there is scope yet for a big industry in Victoria; the chances for and against we will duly discuss.

their origin.

When the early diggers worked for gold on the surface, breaking the ground with pick and shovel, they found that a number of the deposits dipped below the surface, and these they followed down to a considerable depth. Such deposits were really the beds or channels of ancient rivers, filled up with sand, clay, gravel, and water-worn quartz boulders, and sometimes covered with soft volcanic rock; and were found to be continuous for many miles, but always at an increasing depth from the surface.

Quantity of water.

The gold-bearing gravel or 'wash' of these river beds is usually two or three feet thick, several hundred feet in width, and, being of a loose formation, is always full of water. This great flow of water eventually always got the better of the early diggers, and such primitive pumping machinery as they possessed, and one after another all these river beds had to be abandoned.

Pumping problems.

But the deposits were too valuable to be left alone, and companies were then formed to work them, having the necessary funds to provide the powerful pumps that were required.

Madame Berry lead.

Many of these companies were highly successful; the most famous being the Madame Berry—now worked out—which paid over a million in dividends, while other mines on the same lead also earned large profits.

Deep lead mining to-day.

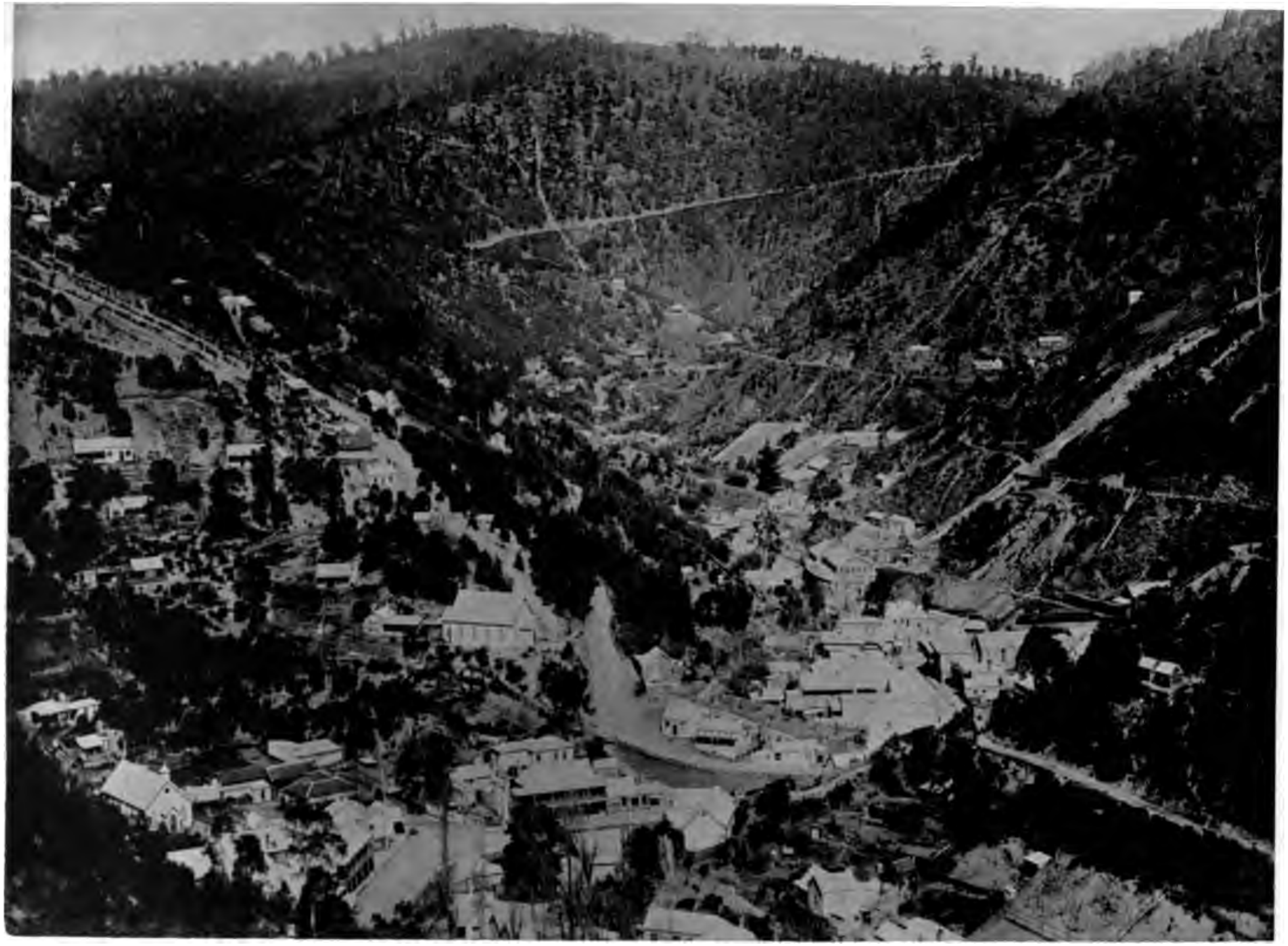
For the last ten years or so most of the best leads have been worked out down to the limit of depth that is possible with ordinary pumping plants. If these valuable leads are to be further exploited, it will be necessary to spend hundreds of thousands of pounds to achieve results, and the financial resources of Victoria are not equal to this. The other alternative open to local mining men was to develop and work the less rich and more uncertain lines of lead, and this was done—with disastrous results.

Rutherglen district.

At Rutherglen and Chiltern, in the North of Victoria, long lines of lead were proved, and it was thought that these would rival in value the Madame Berry. Dozens of shafts were sunk, costly pumping plants erected, and the leads were tapped; then they took several years to drain—during all of which period the pumps were kept at full pressure, and calls were made each month on the shareholders. The net result, after the leads were drained at a cost of hundreds of thousands, was that they barely paid working expenses. Now, nearly all of these Rutherglen mines are shut down, and deep lead mining is in disrepute in Victoria. A few fairly profitable mines, at Maryborough, Pitfield, and elsewhere, still demonstrate that the industry is not dead, but it cannot be described as flourishing at present.

English capital in deep leads.

The costly task of proving whether the continuations of the rich leads can be profitably worked has been undertaken by English capital. These channels have already been worked out, as we have seen, to considerable depth—we will say, to 250 or



WALHALLA. A MINING TOWN IN GIPPSLAND, VICTORIA.

300 feet. Beyond that the channels continue of course. It is certain that a great flow of water will come out of them, requiring immense pumps, but it is not certain that they will continue of the same good value as they were at shallower depths. Deep leads are admittedly capricious in their gold contents, and, moreover, the further away from the probable source of the gold that they extend, the more likely is it that the quantity of gold in the 'wash' may decrease. In any case their value is uncertain, and this cardinal fact must never be lost sight of.

Difficulties t be met.

Gold conte uncertain.

But that is no reason why the money should not be provided and the experiments made, and I am prepared to describe these companies as taking up very legitimate speculations.

Drainage is slow.

But the development of one of these deep lead mines, where a lot of water is certain to be met with, is a costly and tedious business, and shareholders in these English owned mines will have to exercise a lot of patience. At Rutherglen, some of the mines took four years to drain, and one must be prepared to wait for a similar period while the English owned properties do their pumping. However profitable a mine is likely to prove eventually, a fact like this takes the gilt off even the most skilfully drawn prospectus.

Developme described.

The procedure of development is as follows:—The shaft is sunk to, we will say, 400 feet, and is equipped with the most powerful pumping plant that can be erected. The main level, which is about 50 feet under the level of the 'wash,' is then driven; from this bores are put up into the wash, every 200 feet apart, and the wash is allowed to drain, or 'bleed.' This draining, as I have said, may take several years; all the time the pumps are working at full pressure, and there is no yield of gold to balance the heavy expenditure. When the ground is at last dry, rises are put up into the wash and it can be then rapidly cut up ready for working out. It is preferable to begin working out the ground from the extreme boundaries, and allow the roof, which is simply clay and gravel, to fall in behind the miners, but to reach the boundaries there is another period of waiting in addition to the long wait for drainage.

Working th ground out.

Value of bullion.

Working costs yield.

After all this the wash may turn out to be of only moderate or poor value, and in any case no estimate of the yield of gold can be made until all the expenditure is over and the mine both drained and cut up ready for working. The gold when recovered is almost absolutely pure, being worth up to 84s. 8d. per oz., and is usually of a coarse or nuggety nature. The standard of work is by the square fathom of wash, and the yield or cost is reckoned as being so many pennyweights to the fathom. As a rule, a yield of 1 oz. to the fathom is considered a good one, and total working costs average about 45s. a fathom.

Value of the shares.

And now as to the actual value of these English owned deep lead mines. Even assuming that the work they are formed to do is of a legitimate nature, it can easily be seen that there are serious difficulties to be met. Money must be spent in quantities, and for several years, before returns can be looked for; the water may prove too heavy; the value of the wash may not come up to expectations; holders may become dispirited by the delay.

LoddonValley prospectus.

Value of the mine.

When I think of all the uncertainty in an undertaking of this sort, and then glance at the prospectus of the **Loddon Valley Goldfields** (perhaps the chief of these mines) which lies before me, I am filled with amazement. In this document the unconscious humour is of a very high order. A profit of £205,502. 10s. 0d. per annum is confidently predicted, and the arguments for this result are vouched for by such diverse authorities as an earl and a consulting geologist. The capital is given as £750,000—which is about 25 times greater than the usual local capital for a mine of this sort. I went down this mine and saw the work done to date. The upper layer of wash I did not think much of, but I suppose the lower layer, from the results of bores put down, may be expected to be of good value—being a continuation of the Madame Berry lead. In any case there will be no production to speak of before 1903. As to profits, any estimate as yet is quite outside the mark, but under no circumstances can I conceive a profit such as that so readily vouched for by the earl and the consulting geologist.

Mooloort Goldfields.

The neighbouring mine to this, the **Mooloort Goldfields,** is not so far advanced; and I do not suppose that it has enough working capital to bring it to a producing stage.

Junction Deep Leads.
New Havillah.
Charlotte Plains.

In the same district are the **Junction Deep Leads,** the **New Havillah,** and the **Charlotte Plains** Mines, which are off-shoots of the **Victorian Deep Leads Company.** These are to be worked from one central electric plant, but before they are drained and cut up ready for work, several years will have passed.

The **Duke United,** which was opened up before being placed on the English market, is now paying dividends.

All have insufficient working capital.

Other English floated mines are the **Loddon Deep Leads, Australian Deep Leads,** and **Hepburn.** I am sure that the controllers of all these mines, without exception, have underestimated the cost of opening them up; and I foresee many financial troubles unless they are put on a sounder basis. The underwriter's share of the capital has been arranged on a more liberal scale.

Conclusions about deep leads.

Finally, I consider that with sufficient working capital, and with a fraction of the watered stock they now have, this group of mines would be reasonably good speculations; and even as it is the most of them may earn profits. But what these profits are likely to be, and when they may be expected, are questions which I, who am unused to the drawing up of prospectuses, must leave to the earl and the consulting geologist.

Dredging and sluicing areas.

There is no occasion to say much about the dredging or sluicing claims. These have not been a success in Victoria, and very few are worked at a profit. It was assumed that the river sands, or alluvial patches of ground, could be worked as profitably as is being done in Otago, New Zealand. But in actual practice it is found that to reach the layers of gold-bearing gravel, an overburden of great depth, and greater width, has to be removed; and emoval of this all the estimated profits vanish. This is not yet steadily established, and methods may be but at present not one claim in fifty is yielding a profit.

CHAPTER VI.

THE GOLD MINES OF QUEENSLAND.

Queensland.

The great coastal mineral belt.

THE coastal mineral belt of Queensland is over 800 miles long, and about 200 miles wide. This is a great area to prospect over, but it may be said at once that it has not been prospected yet—only scratched.

Gold-mining centres.

The gold-mining centres, from south to north along this belt, are Gympie, Mount Morgan, Ravenswood, Charters Towers, Etheridge, Hodgkinson, Croydon and the Palmer.

These are not large fields. Most of them are embraced within a very few square miles. And yet they represent practically all the gold-mining that is going on in this great mineral area. One cannot believe that these few spots exhaust, by a long way, the payable deposits of gold in the State.

A great deal of prospecting is needed.

Extensive prospecting is urgently called for. Local mining men will not put money into new districts. They still keep to the old fields. But these fields are gradually getting worked out. Gympie and Charters Towers have seen their best days.

I said before that Queensland needs well-equipped prospecting expeditions to go to work all over this mineral belt. This country looks one of the most promising in the world for gold discoveries—and yet they are not being made, because there is no money to back up systematic search. The gold yield is falling off, and the question is almost one for the State Government to take in hand.

Exploring expeditions needed.

An exploring or prospecting expedition, if provided with £15,000 cash, a small sinking engine, portable headgear and pump, an assay plant, and in charge of a working manager who would be his own sampler and assayer, might be a profitable venture. In any case it would b[illegible] legitimate one.

The gold yield of Queensland to date, from these few spots along the mineral belt, has been over £50,000,000, and the mines have been exceptionally profitable. Other minerals worked, some on a large scale, are silver, copper, tin, manganese, and coal. Gold was first found in 1867.

Recent progress in gold-mining.

I have visited Queensland twice since writing the first edition of this book; but can only state that there is no progress being made in opening up new fields. The old mines still do well—wonderfully well on the whole—but their ore must get worked out some day. I can see no mines coming forward to take their place. One or two small reefs at Ravenswood have been found: a little opening up of old properties on the Hodgkinson field has taken place; and several good discoveries have been made at Croydon. But this is all that has happened in the last three years, and these discoveries, after all, are not important ones.

The impression one receives, after seeing all the fields again, is one of disappointment. There are no new discoveries such as I had expected.

The output of gold.

The present output of gold from Queensland is somewhere in the neighbourhood of 800,000 ozs. a year. These are not real ounces—of the value of 84s. 11d., but the ridiculous bullion ounces which the Queensland Government—in order to take a good position among the States on the yearly output—allows to pass for ounces. The average value is probably only a little over 60s. I averaged the yield for 1897, which gave only 63s. 2d. per oz. If, this year, the State of Queensland returns 800,000 ozs. worth 63s. an oz., and the State of Victoria returns 799,000 ozs. worth 80s. an oz., the Queensland Government will proudly claim the greater yield of the two, because it has 1,000 ounces more than Victoria. The reason for the poorness of the bullion is that much of it contains silver; cyanide bullion, too, worth perhaps 25s. an oz., is allowed to be returned as ordinary bullion. On the Croydon fields the bullion is worth often no more than 30s. an oz.; and yet it is customary in Queensland to talk of the rich two and three oz. ore at Croydon as if the ounces were of standard value. The whole system is a wrong one.

The question of returning fine gold or bullion.

To give an idea of the value of the ore on the different fields, I reprint the table of yields for the year 1897. The averages and totals are still much the same as then. Mount Morgan is not included :—

Yield per ton of principal districts.

Name.	Tons treated.	Yield per ton. s.	d.
Charters Towers	198,873	103	7
Gympie	65,106	102	9
Croydon	42,168	68	11*
Ravenswood	20,510	60	10
Etheridge	16,537	75	3

* This is so-called 2oz. ore.

This shows a high yield per ton, but only a small aggregate tonnage treated. In other words, the clean ore, which is easily distinguished by the mineral it carries, is carefully mined, and sorted from a frequently narrow and varying lode.

Bush prospects that are worth examining.

Besides inspecting at different times over 50 gold mines in Queensland, I spent some time in the bush sampling some of the big low-grade formations, and the little prospects belonging to 'fossickers.' It is on the results of assays from these, pannings, etc., that I base my desire to see well-equipped prospecting expeditions at work. Some payable things are sure to be found. Scarcity of water, of course, is generally a drawback ; but rarely a fatal one.

The mines and the market.

Relatively to the mines of other countries, Queensland gold mines are not over-valued on the share market—from Mount Morgan downwards. But even in the stocks that pay regular dividends there is little market activity, and unfavourable news, or the selling of a few shares, causes a mild scare. The mines, in fact, are not widely known.

Working from the south to the north, I will give an account of the present condition of the different goldfields.

Gympie.

Gympie lies about 100 miles north of Brisbane, and 25 miles inland. It is almost the southern point of the great mineral belt.

The first find of gold here was made in 1867, and ever since the field has been an important quartz-mining district. The town now supports a population of 12,000, almost all of whom are directly interested in gold-mining.

Many of the older mines, after paying well, are now worked out, but others holding deeper ground have been floated. At the present time there are probably 80 or 100 companies; but most of these are shut down and only a very few work at a profit. These mines have been financed and developed with local capital, and consequently economy has always been a feature of the management. Sometimes this economy has been carried to excess; the shafts have been made too small, for example. The directors are all practical men, and can be relied on to give practical advice and careful supervision.

Prospects of this field.

Results in the aggregate, have been excellent. A number of the mines in past years, with small capitals to work on, paid great sums in profits.

Little is known in England of the Gympie field, although one or two of the good mines were eventually re-floated in London. Curiously enough, the best mine now at work is a Scotch company, owned entirely in Glasgow. On the strength of this mine, several other Glasgow companies have lately been floated.

On the whole, I think that the conduct of mining on this field—conservative and old-fashioned though it be—is in direction, management, working costs, and results achieved, almost better than on any other mining field I know.

Geology of Gympie.

The occurrence of gold on the Gympie field is most peculiar. Several parallel beds of slate, dipping at about 20 degrees, traverse the country; the thickest of these beds is about 200 feet, and the others are frequently not more than 10 feet thick. In the opposite direction, dipping at a much steeper angle, is a series of strong, well-defined, white quartz reefs. These reefs are valueless, except when they cut through the slate beds, but, at those particular spots, they invariably carry gold, which is often highly payable, and is usually found in a nuggetty state. So common a feature, indeed, is visible gold at Gympie, that each mine is provided, underground, with a strong box, which from time to time becomes filled with 'specimen' stones, taken from the contact of the slate—where it is blackest—and the reef, and worth several hundred ounces to the box-full.

To prove the continuance of gold in depth at Gympie, therefore, one follows—not the reefs, but the main band of slate. When the first reef is reached it will furnish reserves of ore for 200 feet in height, that is to say, for the whole distance in which it is found in contact with the slate band. When this is worked out, a cross-cut is put through the slate to tap the next reef of the series which, in its turn, will also produce the looked-for 200 feet, of good value, and so on. Several of the best located mines have proceeded to work out four or five reefs in this manner, and are still, after long and successful careers, making good profits.

Gympie deep levels.

Within the last few years, at Gympie, the deep level area of the field has been largely developed, and with promise of success. As the slate bands, dipping at 20 degrees or so, reached a depth of from 800 to 1,500 feet, it was found that they encountered a new series of reefs, which, valueless elsewhere, as was the earlier series, frequently carried rich gold at the contact of reef with slate. The success of these deep level mines has revived the fortunes of the Gympie field, and it is in this class of mine, selected judiciously, that English capital may be laid out as a justifiable speculation.

A personal inspection was made, underground, of 12 mines at Gympie, most of which were deep levels. The opinion I formed was, on the whole, favourable as to their prospects, and also in regard to the prospects of a number more in adjacent localities.

The finance of Gympie mines.

A Gympie mine usually has an area of 25 acres, and a capital of not more than £24,000, divided into 5s. or 10s. shares. The vendors' interest is in many cases almost non-existent. As the opening up of the mine proceeds, calls are made on the shares from time to time, but the producing stage has usually been [illegible] when only one half or two thirds of the liability [illegible] been called up. This leaves the shares, even [illegible]dend-paying nes, with a liability of several shillings, which English investors ject to. To add to this drawback is the fact that hardly any of : Gympie mines have London offices. Transfers of stock cannot effected in England, and should a call be made on unpaid ıres, the holder at a distance who does not receive adequate rning is liable to have his shares forfeited. These drawbacks—ıtly, the fact that the shares are usually only partly paid; ondly, that there is no London office where calls may be paid l stock transferred, should be brought to the notice of mining npanies in Gympie. A central London transfer office should be ablished, where also all information from the field, showing the ogress of each mine, could be secured.

Scottish Gympie.

Scottish Gympie Mine.—This is the deepest mine on the d. The black slate band comes in contact with the reefs at .oo feet, and as it is here about 200–250 feet deep, one may look a similar height of 'backs.' The last time I saw this mine, I ınd that the ore formation had widened out to something ormous. At one place it was 300 feet wide! All of this carries ld, but by sorting, and rejecting part of the ore, a return of about s. a ton was being secured.

Great ore bodies:

The problem for this mine is how to fill up or secure the mense cavern which is now opening up as the result of taking t the ore. Square timbering, as at Mount Morgan, is almost too pensive. Moreover, it is going out of date where the walls of the :f are in a hard formation and stand well. Such great ore bodies those I have seen in the Anaconda, Broken Hill, and Great bar mines, which used to be square timbered, are now being placed by filling, which is either run down from the surface, or t by driving cross cuts in from the stopes and using the rock so oken. As a matter of fact, I believe it will pay the Scottish ympie to sort out and leave behind 30 or 40% of the broken ore, ich will go a long way towards filling the cavern. This ore ave, probably, a value of only 3 or 4 dwts., and to use it it come cheaper than square timbering. When the mine out a lot of this low-grade ore, now left behind, could

how these will be worked out.

rich ore as others, nor being so cheap to work, nor paying such large dividends--yet, on all these points combined, it stands an easy first. It is the greatest.

History.

The mine was discovered in 1882; and for several years was worked on a small scale by a syndicate. Its great richness led to its 'flotation' in 1886 as a public company with a million shares. At this time the returns from the ore—then being quarried from the very top of the mount—were much richer than they have ever been since. Much of the ore yielded 10 oz. a ton! In 1889, dividends of £1,100,000 were paid, and about this time the shares touched the extreme price of £17 5s. When it was found that the rich ore was of limited area, a big reaction took place, and by 1882 the shares had fallen to £1 10s. This low figure of valuation was not warranted, as already development had proved immense bodies of ore of a lower but, none the less, highly payable value, and a gradual appreciation in price, based on steady average returns, then began.

Description of Mount Morgan:

The mount itself forms one of a chain of small hills covered with the stunted gum tree which grows everywhere on the gold belt--indeed over the greater part of Australia. Twenty years ago the place was in solitude; now the valley below has a flourishing town, the sides of the mount are covered with acres of the finest machinery, and the whole top of the mount itself has already been quarried away.

It must not be imagined that Mount Morgan is a hill of solid gold-bearing quartz, but, as a matter of fact, the greater part of it *is* gold-bearing. All the top of the hill, equal in area to 250 yards long, 400 wide, and 150 deep, has been, or will be, quarried away. Of this bulk more than half is ore! Below this the sides of th
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there is practically no lessening at this

None of the other Gympie mines are at present doing anything much. It will be seen that the three big producers are all deep level mines: all lie close to one another, and all are working at the greatest depths reached on the field. All the ground in this vicinity, deep though the gold lies in it, is well worth exploration. I think local mining men quite realise this now, and funds will be put up to carry down several of the shafts. I instance the shaft of the **No. 1 South Oriental and Glanmire** as the most favourably situated of these. At a greater depth still the formation is thought to be cut off by a big fault known as the Inglewood dyke which cuts regularly across the country. At shallow levels nothing was ever found beyond this: the presumption is that the gold cuts off against it.

Other Gympie mines worth nothing.

Three hundred miles north of Gympie is Rockhampton. A few miles inland from here is **Mount Morgan.**

Mount Morgan. (Issued capital, 1,000,000 £1 shares: 17/6 paid.)

I place Mount Morgan as the greatest gold mine in the world. This is not a mere figure of speech, but the result of a comparison between this mine and the other biggest mines.

Those that most nearly approach it are the Homestake, in South Dakota, Robinson, Simmer and Jack, and Ferreira Deep in the Transvaal, and Waihi in the North Island of New Zealand.

This mine has a great past, having paid over £5,500,000 in dividends; it has an immense ore body, ensuring yields for 20 years to come; the average value of the ore is comparatively high; the working costs are low; and the management and direction of affairs are in careful and conservative hands.

The greatest gold mine!

None of these other great mines equal Mount Morgan on *all* of these points. The Homestake and Simmer and Jack treat far more ore, but it is low grade. The Robinson and Ferreira Deep are richer, but they have not the past record, and they will be worked out while this mine is still producing. A mine like the Alaska Treadwell can be worked for one-fifth the cost, but its ore is eight times as poor. The Golden Horseshoe is twice as rich, but it has only one ton in sight where Mount Morgan has ten, and so on. While not having more ore than several mines, nor as

compared with other big mines.

rich ore as others, nor being so cheap to work, nor paying such a large dividends—yet, on all these points combined, it stands an easy first. It is the greatest.

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its geology.

As I said before, when any two geologists agree as to what the Mount Morgan ore deposit really is, and how the gold got there, I will agree to accept their opinion as my own—with no questions asked. I have read four reports on the geology of the mount. Each is diametrically different to the other in the conclusions arrived at.

Perhaps the occurrence of the gold is due to a thermal spring, or a geyser; but then, how was it precipitated? And why is there only one deposit? Within a mile or two there are hundreds of similar small hills. All these have been explored without finding anything at all. Why should there be only the one deposit—so strangely placed and so immensely valuable?

The treatment plants.

The two large plants, one for treating oxidised, the other sulphide, or—as it is called locally—mundic ore, are now finished and at work. These handle 20,000 tons a month. This will be followed by the shutting down of the older and more expensively worked plants. In the course of two years from now I look for the erection of another mundic plant of the new design, which would raise the monthly output to well on for 30,000 tons. In the meantime, 20,000 tons may be taken as the figure on which to base profits.

Success of the treatment of mundic ore.

The oxidised plant has been a success for years. The mundic plant, over which there was a little anxiety, is now also doing fine work. The difference between the two is that the mundic ore requires a much more thorough roast to liberate the 10% of sulphur present. The mundic ore, too, is far harder to break, both in the mine and in the ball mills. The total cost of treating it is about 10s. a ton more than for treating the oxidised ore. I think the figure I gave before, of 19s. as the average cost per ton, taking oxidised and mundic together, is not far out.

Proposals for reducing working costs.

The management has lately been taking note of the relatively high cost of mining the mundic ore, and timbering the caverns. The manager and engineer visited the Michigan and Minnesota iron mines, where great work is being done with steam shovels.

Handling ore in bulk.

and it has now been decided to use these at Mount Morgan. The result will be that the whole of the sides of the hill surrounding the ore body will be mechanically stripped away, and it will be possible to quarry out the whole mass of ore down to a depth of at least 450 feet. This will mean a decided saving in mining costs and in timber. I suppose it may easily mean a saving of 1s. a ton on the ore so handled.

The water supply.

As to the lately defective water supply—necessitating shutting down for several months—a large dam has now been built. When this is once full, and the first good rain (an event likely to happen long before this is in print) will do this, there will be a permanent supply.

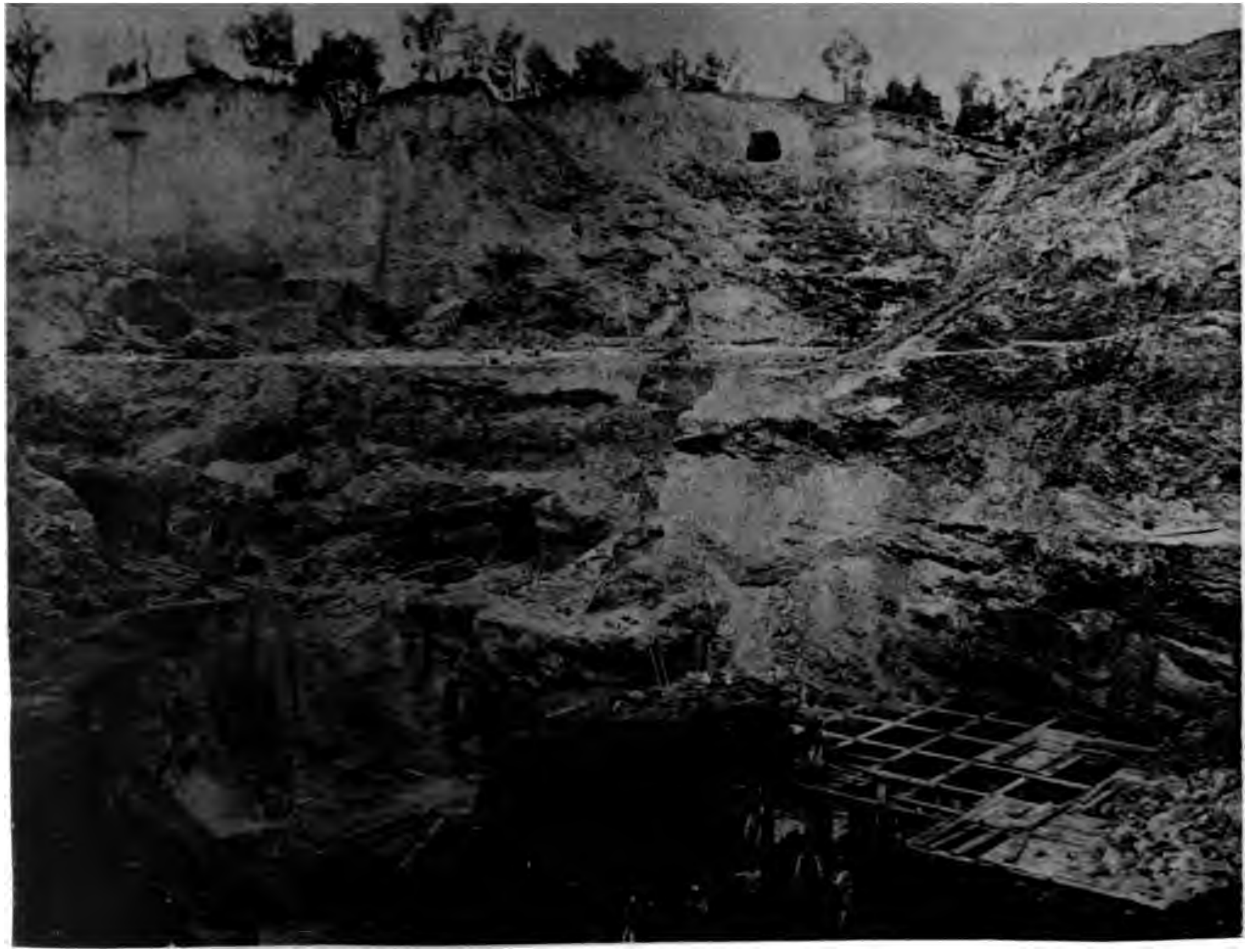
The treatment of the ore is by dry crushing and chlorination. The average cost, as has been stated, is somewhere about 20s. a ton; and the average extraction is rather over 95% of the gold contents. In the ore in depth one-half of 1 per cent. copper is found. It is hoped that this can be mostly recovered as clear profit, but this asset I do not yet take into account. The company makes its own sulphuric acid.

Future results of profits.

The management proposes to treat in future a monthly tonnage of 20,000 of an average value of 14 dwts. The gold recovered from this would be about £52,000—the figure I estimated in 1898. Even allowing 22s. a ton for working costs, there is a monthly profit shown of £30,000, which is enough to continue the dividend of 7d. a share a month. The dividend may or may not be reduced to 6d. a month, but it seems reasonably certain that this will be the value of the yield, and the profit, for many years to come.

Value and quantity of ore reserves.

And now as to the most important point of all—the value of the ore reserves. The development work done during the last three years has shown that the ore body is getting distinctly poorer in depth. Below the 450 foot level this falling-off begins to show, and it increases to 650 feet—the lowest point yet explored. Of course this statement is relative. It will take many years to work the mine down to 450 feet. During all that time profits on the present scale will be earned. After that there will be a falling-



J. H. Lundager, Photo.

MOUNT MORGAN—OPEN WORKINGS.

off, but it will be so gradual that those of us then alive will hardly realise the change. We may assume, and this is a statement based on all that there is to be known about the mine, that the ore in sight will last for 20 years more, that the profits for the first 10 years of that period will be approximately on the same scale as at present, and that the profits for the second 10 years will show a gradual falling-off.

But let me add a rider to this. Not half enough exploration work has yet been done to determine the area of ore in the mine. So much is known—enough ore for 20 years let us say—but it is almost certain that other subsidiary bodies exist which have not yet been located. Only as late as 1900 such a patch of ore, and of high value, was discovered on continuing an old drive. It gave 200,000 tons! I repeat that this is a point sure to turn out favourably.

Again, note the change in the problem, if, instead of treating 20,000, they treat 30,000 tons a month. This will come about almost certainly. It will give shareholders back their money more quickly, and add to the value of the shares as an investment.

To the above add the advantage to be gained from a gradual cheapening of costs.

The shares as an investment.

Outside of the leading dividend-paying Rand mines, there is not a gold mine in the world on the sound basis of Mount Morgan. Even with lower ore values in the bottom of the mine, it is still an investment in every sense of the word. I assume that for the next ten years it can earn an average of £350,000. At the present price of £4 for the shares, that is a yield of 8½%. After that there will still be many years' work. If profits are to fall off, why should the output not be doubled? There is no reason to prevent it. My advice to the holders of Mount Morgan shares is—Don't sell!

Mount Usher.

In this district is a small mine producing gold **Mount Usher.** It is one of the hand-to-mouth class of mines, with never enough ore in sight to make the shares other than a gamble. But apparently the mine is worked with energy.

Ravenswood field.

The next field to the north is Ravenswood. This locality was first prospected in 1870, but was almost deserted after the discovery of Charters Towers.

Refractory ores of the district.

Close to the town are a number of reefs which carry patches of quite rich ore; but this ore is so refractory that it has to be smelted. By the time the ore is mined, often from a narrow reef, sorted, bagged, sent by rail to Townsville, and from there to a smelter where the usual deductions are made, the costs have mounted up to between £5 and £6 a ton. The small syndicates who forward this ore have to wait some time for their cash. If one of the smelting companies sent an agent up here, who would buy ore on the spot, for cash, and advance small sums here and there to help the small producers, I believe the field would increase its output to some extent.

Smelting companies note!

New Ravenswood.

A company owning several of these refractory reefs is the **New Ravenswood.** Some of its reefs are worth developing.

A few miles from Ravenswood is the new Donnybrook district, where in the last three years one or two small reefs have been opened up. These reefs are very small, indeed, averaging perhaps 6 inches, but are unusually rich. Several of the mines produce from 5 to 15 tons of ore a day, worth often £30 a ton. But I am afraid of these little reefs in depth, especially if they meet with a dyke or fault. In the meantime they yield profits.

Donnybrook Blocks.

An English mine working on these new discoveries is the **Donnybrook Blocks.**

Two other English mines, some miles from Ravenswood, the **John Bull** and **Hadleigh Castle,** appear to have shut down. I believe they are in liquidation.

As I said before, the Ravenswood mining district is one of those best worth prospecting—not only near the centre, but out in the bush.

Charters Towers.

Charters Towers is 50 miles from here. It is the most important mining centre in Queensland, and after Kalgoorlie, the biggest goldfield in Australasia. It lies 80 miles inland from the port of Townsville, and 800 miles north of Brisbane. The field was discovered in 1871, and has been an important one ever since. It supports a town of 23,000 inhabitants, and turns out at present £3,000 a day of gold.

Nature of the ore.

The reefs, of which there are a great number, lie within an area of several square miles. They are fissure veins of whiteish quartz, lying in solid granite, and where richest, carry frequent splashes of galena and pyrites. The reefs are free milling, and amenable to cyanide; concentrates are collected and treated locally by chlorination, for which process there are several customs plants. The lodes carry more or less defined chutes of rich ore, but on the whole they are irregular in their occurrence and in their values. Generally speaking, calculations of the value of Charters Towers mines are only safe when they deal with ore actually in sight, and all estimates as to the lives of the mines or their probable dividends, except from ore developed, are more or less guesswork. Some of the best mines have a good deal of ore in sight.

There are probably 100 mines in existence within a radius of three miles of Charters Towers, but the great majority of these are unimportant, owned locally, and need not be noticed in detail.

Principal lines of reef.

The principal lines of reef now being worked, and in which English capital is sunk to a considerable extent, are the 'Brilliant,' 'Day Dawn,' 'Victoria,' 'Queen,' and 'Victory' reefs. Apparently the 'Brilliant' and 'Day Dawn' reefs lie deepest in the series, and as they are also the largest and richest now being worked, the future of Charters Towers may be said to depend upon their productiveness.

Neither of these principal reefs appears to have any great lateral extent, and as they are being worked out by not only the outcrop mines, but by several rows of deep levels simultaneously, they are gradually becoming exhausted.

Charters Towers town and people.

Charters Towers is a flourishing town. In no town of its size elsewhere, are there so many working-men, miners, foremen, and such like, who are worth at least £1,000, either in cash or in property. The bigger part of the dividends from the mines are distributed locally, and there is always local capital forthcoming for any promising mining venture.

Local mining methods : good and bad points.

Speaking generally, mining at Charters Towers is conducted with soundness and honesty. The Charters Towers miner, for example, is a better man than the New Zealand miner, and the financial conduct of affairs is a long way superior to Western Australia. But there are many faults to be criticised. The local capitalists have the entire control of the mines, and, not infrequently, have used this control, although standing in the fiduciary position of directors, to their own advantage. Taking the actual mining, it may be said to be well and economically performed. After the ore is raised to the surface, however, its handling is by no means so judicious. To begin with, few of the mines possess ore bins; the ore is therefore tipped on to the ground, whence it has to be shovelled into carts at an extra and totally unnecessary cost of quite 1s. per ton. It is then carted—not to the company's own mill, for few of the mines own a reduction plant—but to a customs mill where it is crushed and roughly concentrated at a cost of 13s. or 14s. per ton. These customs mills usually belong to the local capitalists, who are also directors of the various mines, and it is not to be wondered at that they, in their capacity of directors, never protest against the extortionate charge for milling the ore, which, in their other capacity of mill owner, goes into their own pockets. This abuse has always been a flagrant one at Charters Towers. There are many mines with years and years of ore in sight which have rather preferred to go on paying 14s. per ton for milling, than put up their own battery, which would have paid for itself in a couple of years.

In other departments, except the actual handling of the ore, Charters Towers mines are well run. General expenses, secretarial and directors' fees, are extremely moderate, and the finance of the companies is usually well conducted.

The unfavourable features referred to appear to afford no anxiety to local shareholders, who are educated to expect early dividends at the sacrifice of all expenditure on capital account or machinery, and as for the local press it is painfully non-critical. It really rests, therefore, with English shareholders to protest against these abuses.

English flotations and local ones.

From time to time, whenever the state of the money market admitted of it, the English public has been saddled with a series of Charters Towers mines which local speculators had refused to take up, or which they had practically worked out. Among these are such names as the Mosman Gold Mines, Lady Carrington, Golden Gate, New Charters Towers, Charters Towers Consolidated, Peabody and Berkshire, Rainbow and Peabody, and Towers Hill. All these mines are failures, as was to be expected from their localities. It is almost surprising that Charters Towers, good field as it is, is not looked upon with more suspicion by English investors than is actually the case. Its reputation is, however, saved by the regular dividends from such mines as the Brilliant, Brilliant St. George, Day Dawn and Wyndham, Victoria, Kelly's Queen Block, and Band of Hope, of which mines a number of shares are held in England.

Future of the field.

Within the last few years, about 70 small cyanide plants have been erected near Charters Towers to work the old tailings, which for years had been allowed to run to waste, and which have filled the river beds for miles. Returns from these helped to raise the monthly output from the field to about 40,000 ozs., but I am of opinion that at about this figure the maximum of production was reached. Some years more of profitable results may be expected from the 'Brilliant,' 'Day Dawn,' and 'Victoria' lines of reef, but after that several of the now best-producing mines will have been worked out, and I see no new mines likely to take their place.

'Brilliant' line of reef.

The 'Brilliant' line of reef, or rather the one payable chute on that reef, is the most valuable ore body at Charters Towers.

This chute was never found near the surface, but was first worked in the Victory mine at a depth of 300 feet. From there it passed into the Brilliant, the deep level of the Victory; then into the Brilliant St. George, the deep level of the

The direction of the ore chute:

Brilliant; and now it has passed into the Brilliant Central and Brilliant Extended, which lie below the St. George. These mines contained the main run of the chute, but fringes of it were also found in the East Mexican, Brilliant Block, Brilliant Freeholds and Phœbe. A lot of good ore, too, was found in Kelly's Queen Block.

I may state, in general terms, that all the payable ore has now been worked out in the Victory, East Mexican, Brilliant Freeholds, Brilliant Block, Phœbe, Kelly's Queen Block, and Brilliant. There is still a lot of unworked ore in the Brilliant St. George and Brilliant Central, and probably in the Brilliant Extended and Bonnie Dundee.

its value and direction in depth.

At the lowest points where the chute has been explored, that is in the Brilliant Central and Brilliant Extended, it is about 2,200 feet deep—vertically. At this point the lode is strong and the value good. As the chute dips obliquely, and is well-defined in its course, it may be expected to enter the ground of the Bonnie Dundee, and perhaps, further on, the Columbia (Charters Towers), mines. There seems no reason why this ore body, seeing that it has kept its value for such a great depth, should not continue payable to a vertical depth of at least 3,000 feet!

Dividends.

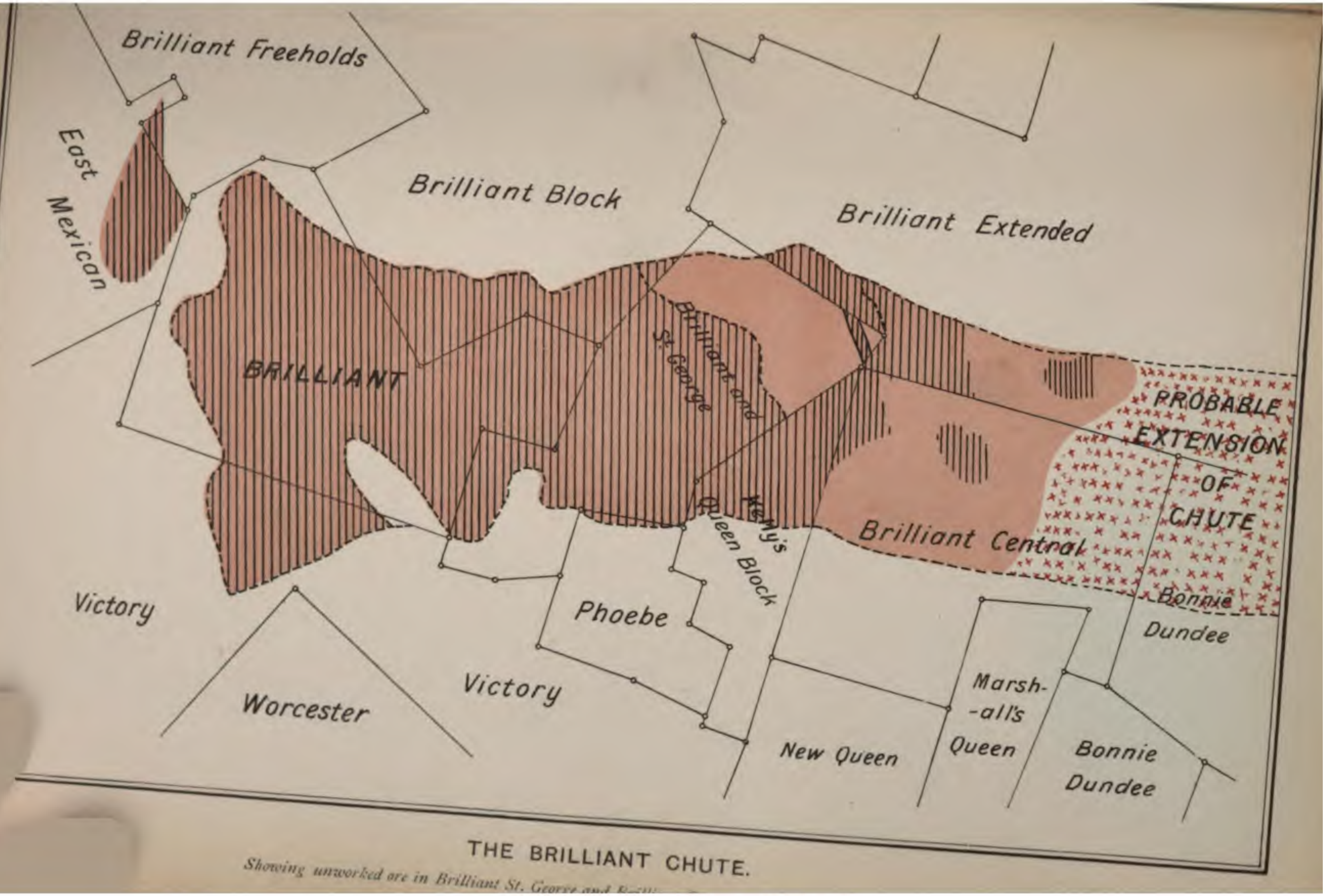
To date, dividends of nearly £1,500,000 have been paid from this chute of ore. This figure will be largely increased from ore now in sight in the Brilliant St. George and Brilliant Central mines.

Victory, East Mexican, Brilliant Freeholds, Brilliant Block, Phœbe, Kelly's Queen Block, Brilliant.

In describing the individual mines working on the 'Brilliant' reef, I omit those which are, so far as can be seen, already worked out. These are **Victory, East Mexican, Brilliant Freeholds, Brilliant Block, Phœbe, Brilliant,** and **Kelly's Queen Block.** In the latter mine, however, some payable ore may be found on a footwall branch of reef.

Brilliant Deep Levels.

The **Brilliant Deep Levels** mine sunk a shaft and cut the reef at 2,200 feet. As far as I could judge, the ground of this company is off the line of chute, and it is not likely to get payable ore. A great deal of exploration has been done



THE BRILLIANT CHUTE.

Showing unworked ore in Brilliant St. George and

at this big depth, with, as yet, poor results. The reef is there, a solid, well-defined body, but of small value. Undaunted by failure, the shareholders have pluckily kept on working, and, of all the mines in Queensland, this is the one in which I should most like to see a discovery of payable ore.

Brilliant St. George. (Issued capital, 144,000 10s. shares.)

Brilliant St. George. This valuable mine, located in the heart of the 'Brilliant' chute, has yet got a lot of unworked ore. On one side the Kelly's Queen Block has worked up to the St. George boundary, leaving a good reef exposed, and below it the Brilliant Extended has worked also up to the St. George boundary, leaving a good reef exposed. Between these boundaries and its present workings there is a distance of some hundred feet of unbroken ground.

Ore reserves.

I estimated in July, 1898, that there were 300,000 tons of ore still to work. Since then about 120,000 tons have been mined, leaving 180,000 tons still in the mine. This would be six years' work from July, 1902. Some of this ore has been proved, on development, to be unpayable, so this estimate may have to be reduced. But this is not certain. On my first visit to the mine, in 1898, I walked along the old stope of the Brilliant Extended, and was shown the reef of the Brilliant St. George, exposed along a distance of over 400 feet. This is a body of ore five feet wide and heavily mineralised. I was assured at the time that the value of this ore was 30 dwts., *i.e.*, £6 a ton. As the mine was then yielding about £5 a ton, I assumed, naturally, that there would be no falling-off in value, over the intervening distance of unexplored ore. I now believe that this statement that the ore along this boundary averaged £6 a ton, was incorrect. Two years ago the Kelly's Queen Company, in order to get air, put a winze up from the Brilliant Extended to their own mine—passing through a corner of this ore. Its size was first-rate, six to seven feet thick, but the value recovered from it averaged barely £4 a ton. This is good ore, of course, but the lesser value of £2 a ton makes a difference of nearly one-half in the profits.

The truth, I believe, is that this lower part of the mine is not so rich as that worked up to a year or so ago, because the chute has turned a little flatter, and instead of going right down into the Brilliant Extended, has passed through Kelly's Queen into the Brilliant Central. In the Brilliant Central they are now getting such ore as the Brilliant St. George had a year or two ago, that is to say, the very heart of the chute; the consequence is that the lowest two or three hundred feet of the St. George ore is not really in the best run of the chute, and this area has therefore suffered a partial falling-off in value.

Value of the shares.

But this falling-off in value is only relative. The ore yet to be worked will, I think, average nearly, or quite, £4 a ton recovery value. On this there will be a profit of over £2 a ton. Taking 120,000 tons of ore still to work, and a profit of £2 a ton, this gives £240,000 as the profit still in the mine. At 33s., the present price of the shares, the mine is capitalised at £238,000. This takes no account of a longer life than four years, or the finding of richer patches of ore—possible contingencies. I believe the shares are now standing at less than their real value.

Brilliant Extended. (Issued capital, 200,000 10s. shares.)

Brilliant Extended. In this mine there was reason to expect that a big area of the chute would be found, but so far only the fringe of it is met with; the best part of the ore is going through the adjoining mine, the Brilliant Central.

Further on, the chute may take a downward turn, and on the chance of this, Brilliant Extended shares have a speculative value.

Brilliant Central. (Issued capital, 100,000 £1 shares, part paid.)

Brilliant Central.—Four years ago, when I saw this mine first, there was no payable ore in sight. To-day it is the best mine, and biggest producer, at Charters Towers. The 'Brilliant' chute of ore passed through Kelly's Queen Block into the Central, and the very heart of the chute runs now right through the mine.

In July, 1900, I saw the mine after this good ore had been exposed, and walked along several levels which showed a fine reef. The average width seemed to be about five feet. This ore is now being mined, and is yielding nearly £5 a ton! There is a number of years' work ahead for this mine, and big profits will be earned. Probably the shares are worth £4.

Bonnie Dundee.—After leaving the Brilliant Central, the chute—if it continues—is almost sure to pass into the Bonnie Dundee. The vertical depth of the ore here would be about 2,500 feet, and a shaft is now being sunk to look for it. In this mine there are several shallower reefs being worked too, but they give no real profit. The prospect for the 'Brilliant' reef is good, and the shares are quite a first-class speculation. As a gamble, they are well worth the present price of 15s.

Bonnie Dundee. (Issued capital, 120,000 £1 shares, part paid.)

The 'Day Dawn' line of reef still continues to yield good ore. The best of this is found in the Day Dawn Block and Wyndham, but the Day Dawn (P.C.), Day Dawn Gold Mines, and Day Dawn Freeholds Consolidated also produce at a profit. When the shaft of Mills' United, is sunk deeper, it, too, ought to get into payable ore.

Day Dawn Block and Wyndham.—This mine has still a large area of ore unexhausted. Much of this is payable. There is no doubt that payable returns will be made for a good many years still. I suppose that the amount of ore in sight at the present time, although I have no actual record of it, is as great as it has ever been in the mine's history.

Day Dawn Block and Wyndham. (Issued capital, 498,400 £1 shares.)

The present dividend is 2s. a year per share. This, on the present price of the shares—14s.—is over 13 per cent. At this price, I think the shares are on a sound basis of value.

Day Dawn (P.C.).—The main ore body in this mine is worked out, but a small vein lately found is being worked at a profit. There is on hand a quantity of old tailings. These are being treated at a profit. The prospects of the mine are small.

Day Dawn (P.C.).

Mills' United.—There is a chance that at a greater depth than the present workings, payable ore will again be found in this [illegible] But it is almost imperative that it should

Mills' United. (Issued capital, 300,000 £1 shares, part paid.

[illegible] **Consolidated.** [illegible] way [illegible] under [illegible] under [illegible] This ore [illegible] mine. [illegible] the [illegible] area [illegible] either [illegible] sold. [illegible] small [illegible] in [illegible]

[illegible] **[illegible] Association.** [illegible] The [illegible]

[illegible] [illegible]

The New [illegible] [illegible]

[illegible] still in the [illegible] All work [illegible] the reefs [illegible] **Cecil Syndicate** was formed [illegible] mines. As yet [illegible]

[illegible] railway of the Chillagoe [illegible] the Chillagoe, Mount [illegible] mines, it will tap a district full of [illegible] tin is the chief of these, and wolfram is also [illegible] But as yet I know of no gold mines.

Etheridge field.

Further inland from here is the Etheridge field. It is still in the stage it was three years ago, always producing a little gold, but no capital being put in. Mining men are, I think, afraid of the scarcity of water. The late warden of the field told me that water could be stored if dams were only built. In any case, I think the Etheridge and Woolgar district might be called to the attention of prospecting parties.

Croydon field.

I have not yet visited the Croydon field. At present it is doing well, but the several paying mines are all in the hands of local people. The nine or ten English companies floated on this field have all been failures.

Palmer field.

In the York Peninsula, the most northern quartz-mining field in Australia, is the Palmer field. This was once a great alluvial field: I am told that as many as 15,000 Chinese worked here once; there are still several hundreds. I visited the field at the end of 1900. The mines are practically all shut down, or being worked by small syndicates of miners. It is doubtful if they hold their ore values in depth.

Twenty-five miles distant is Mount Buchanan. A Melbourne company is opening out a big low-grade deposit on this hill. I think the water problem here is serious, and the ore is low grade.

Conclusion—a summary of mines.

The Queensland mines that it is worth closely watching, are:—

Mount Morgan.
Scottish Gympie.
No. 2, South Great Eastern.
South Glanmire and Monkland.
No. 1, South Oriental and Glanmire.
Brilliant Extended.
Brilliant St. George.
Brilliant Central.
Bonnie Dundee.
Band of Hope.
Day Dawn and Wyndham.
Mills' United.

CHAPTER VII.

THE GOLD MINES OF NEW SOUTH WALES, SOUTH AUSTRALIA, TASMANIA, NEW ZEALAND, AND NEW GUINEA.

ALL the Australian States produce gold. Victoria, Queensland, and West Australia, are dealt with separately. In the present chapter I deal with New South Wales, South Australia and Tasmania; I have also included New Zealand, and all that there is as yet to be known about gold-mining in New Guinea.

New South Wales.

No mine of note.

New South Wales.—There is not at the present time in New South Wales a gold mine of any real importance, and with the exception of the Cobar mine, there is no mine turning out regularly 1,000 ozs. per month. This is surprising, because gold is worked in hundreds of spots in the State, and under such conditions there ought to be twenty mines with a yield above 1,000 ozs.

Private mines

In a number of places, notably at Wyalong, parties of working miners are making a living—sometimes more than this—but the reefs that they work are narrow and faulted, and controllers of capital fight shy of the risks of turning these into larger concerns.

English owned mines.

Wentworth.

Aladdin's Lamp.

There are probably fifty or sixty English floated gold mines in New South Wales. Most of these are shut down; hardly any are profitable. There is, apparently, no successor to the once rich Wentworth mine; even this property has been liquidated and is now, I believe, included in the **D'Arcy Wentworth** ground. The **Aladdin's Lamp**, in the same locality, is not now paying, and the Lucknow field, which used to be the best in the State, seems to have collapsed.

Baker's Creek.

In the Hillgrove district, too, the yields have fallen off. The **Baker's Creek,** which is privately owned, still turns out a small amount of gold, but no English owned mines in the district are doing any good.

Gibraltar.

The **Gibraltar** mine, at Adelong, once earning profits, has turned out a disappointment. In depth, the pay chutes, which were never of great length, seem to have contracted still more, and the mine is badly cut up by faults. The reef, too, is narrow, and although a small profit may still possibly be made, the prospects are not good.

Gallymont.

Mount Boppy.

Mount Drysdale.

The **Gallymont** mine came early to grief. Now the company has secured an interest in the **Mount Boppy** mine. This property is reported to have several years payable ore in sight; but the workings are not yet deep enough to allow of any definite statement as to the permanency of the mine. At present it is being worked at a profit. In the same part of the colony is a local mine, **Mount Drysdale,** at present putting out a small quantity of rich ore, but there is no reason to think that the deposit is a permanent one.

Cobar.

Gold ore and copper ore.

At Cobar, the **Cobar Gold Mines,** with a fine surface plant, and a mill of 100 stamps, is crushing about 6,000 tons a month from an immense low-grade lode. This gold-bearing ironstone, which runs for several miles, is really the capping to a copper lode which lies underneath it, so that when the mine is worked out down to where the copper commences, it will probably cease to be payable as a gold mine. In the meantime, the gold-bearing lode is of great size, often 50 feet wide, and I saw ore in sight for a number of years work. At about 300 feet, I believe, traces of copper have been already found, but it will take years to exhaust the mine to that depth.

Value of the shares.

As to the value of the shares, it is difficult to arrive at this. In 1900 a so-called profit of £22,000 was earned, but the actual amount available for dividend was probably only £10,000, or 3s. per ton trea [illegible] he future, additional gold will be recovered from slimes by filter presses, but I imagine that the grade of ore treated may fall somewhat. I expect an average yield of not more than £1 a ton, and—at this—a clear profit of 4s. a ton. This would be equal to 8 % on the shares at par, and might be continued for some years. But when the gold ore is exhausted—when the copper ore shall be met with—it is uncertain that the mine will continue to earn profits. If the copper ore, like that in the adj obar Copper mine, should be smeltable, the company e a great future. On the other hand, should the ore l which I fear, the only way to treat it would be by conc and that course on the Cobar field has so far proved a fa The mine seemed to be soundly handled; and is interesting ing an exceptionally low grade mine.

The copper ore is of doubtful value.

Occidental.

Further along the line of th reat mineral lode at Cobar, is the **Occidental** mine—locally o ed. Here the formation has been taken out in a huge open ut, probably 50 feet wide, and 150 deep. The walls are sta ng as true as if laid out with mathematical instruments. Here, too, the yield per ton is small, and I suppose that before long traces of copper will begin to show in the bottom of the mine.

Local mines.

Other mines along the line of lode are the **Young Australian** and **Great Western.** The best patches of gold ore have been picked out of these, and they are now shut down.

Dredging.

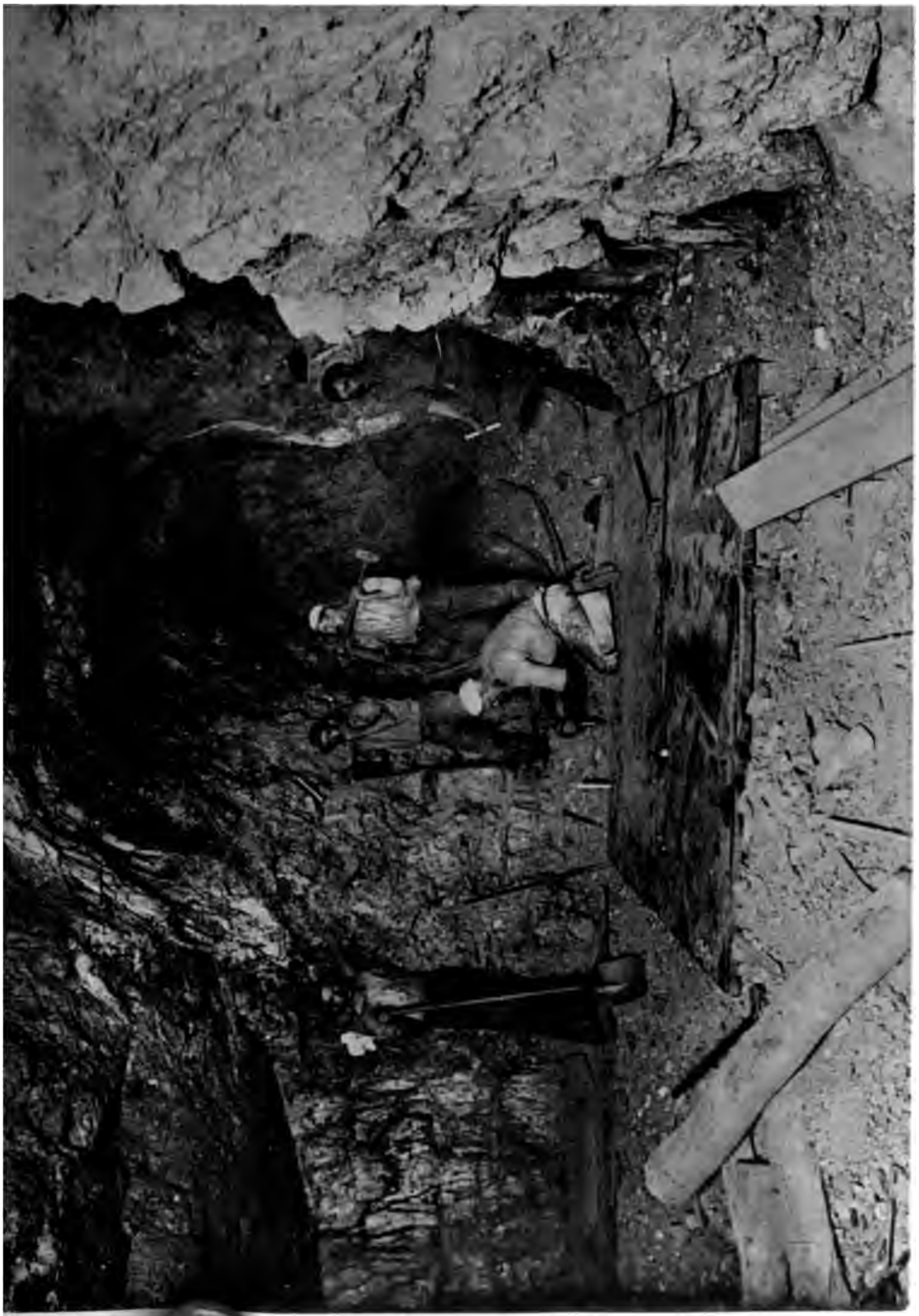
A number of dredging and sluicing plants have been erected during the last year or two on the rivers of New South Wales, but, as in Victoria, they are either being worked at an actual loss or with no profit.

The total yield of gold from the State, from the commencement of mining, has been about fifty millions sterling.

South Australia.

Tarcoola field.

South Australia is the least important gold producer of Australian States. At present a new field is being opened u Tarcoola, which is almost in the heart of the continent. I think that any discovery of real permanence has been m



COBAR GOLD MINES. A DRIVE ON THE LODE.

yet, and in any case scarcity of water, and cost of freight, are serious difficulties which have to be met. Judgment about this field has to be suspended in the meantime.

Northern Territories.

The only other field is in the Northern Territories, to the back of Port Darwin. This district I have not visited, and opinions about its value are conflicting. Judged on results it has done little. Here, again, water is scarce, the heat is great, and thefts of gold by the Chinese workmen are common. Parties of working Chinamen make a living in the Northern Territory gold mines, but I think that the country is overrated as a place for English capital. South Australia has yielded gold to date to the value of 2¼ millions.

Tasmania.

Tasmania.—Gold mining in Tasmania can be described very succinctly. Practically the whole of the present yield is got from the Tasmania and New Golden Gate Gold Mines, and from the Mount Lyell Copper Mine—the ore of which carries about two pennyweights per ton of gold.

Yearly output.

Outside of these sources the yield is practically *nil*, and the yearly output may be approximately stated as follows:—

	ozs.
Tasmania	27,000
New Golden Gate	16,000
Mount Lyell (smelter)	22,000
Various	2,000
Total (say)	67,000

Various goldfields have been started at one time or another in Tasmania—at Lefroy, Mangana, Ringarooma, Mathinna, and Beaconsfield; but with the exception of one payable mine at each of these latter fields, nothing of permanent value has been found; it is curious that the only two payable gold mines in Tasmania should both have yielded unusually good results.

Tasmania mine:

Yield and dividends.

The **Tasmania** mine was started in 1877, and up to this time has yielded about 450,000 tons of ore, worth 86s. a ton; the dividends paid on this are about £770,000.

The reef is of white quartz, now worked out to about 750 feet deep; its average width is eight feet, and the chute of pay ore is over 1,500 feet long! In the lowest workings I saw that the reef was as well defined as ever, and there is little falling off in value. These facts show the Tasmania to be a great mine.

Immense flow of water

causes great expense.

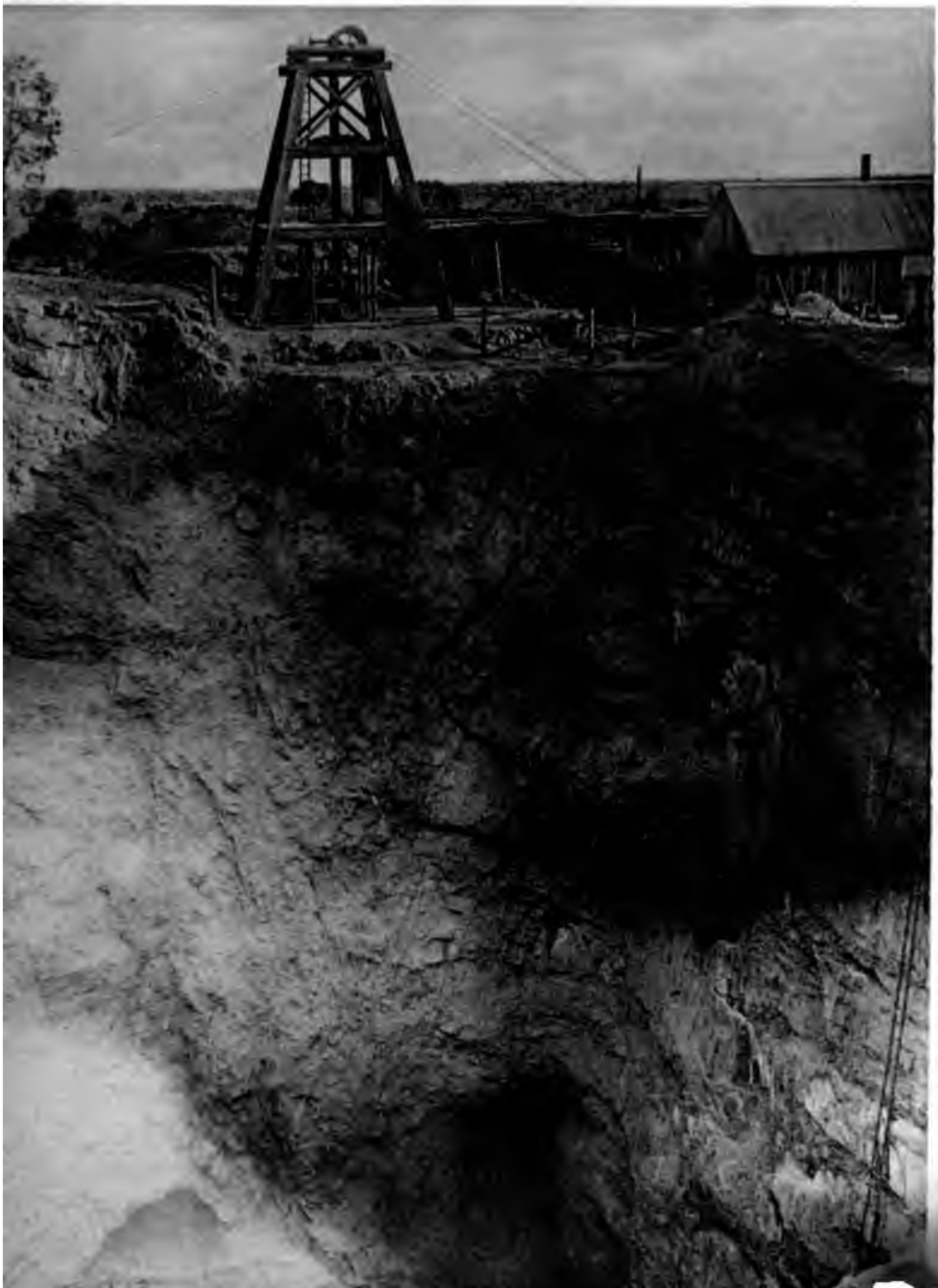
But there is a trouble. The Tasmania is the wettest gold mine in the world; every twenty-four hours three million gallons have to be pumped from it, and the ground is rendered so loose by the continual flow of water, that the bill for mine timber is as heavy as that for pumping. I saw water pouring in a deluge down the old stopes, and flowing a foot deep along the drives; a whole regiment of men were at work on the pumps, and on sawing and fitting huge blocks of timber, and the miners who were actually engaged on the ore itself were in a minority. I can well believe that the water trouble costs the management of the Tasmania, directly and indirectly, 35s. per ton of ore treated. I analysed the report for the six months' period ending August, 1900. This shows the following result:—

Tons treated (65 stamps) ...	10,620	
Gold from mill (say)		£32,250
„ chlorination works (say)		11,250
		£43,500
Expenses		39,680
Profit		£3,820

Working costs.

This is equal to a profit of about £7,600 a year. The yield is about 82s. a ton, the expenses 75s., and the profit 7s.; this latter would have been somewhat larger but for capital expenditure on a new shaft. None of these figures are prepared by the company. During the period in question a quantity of rich concentrates on hand were treated, and the profit and loss account shows a profit of over £17,000, but I found on analysing the figures that the profit earned by the mine itself was approximately what I stated, *i.e.*, £3,820.

The lesson to be drawn from this is that the Tasmania, though its reef is as good as ever, has become so costly to work,



OCCIDENTAL GOLD MINE AT COBAR.—OPEN CUT

owing to the great flow of water, that on its present small scale of tonnage treated, only very small profits can be looked for.

Under offer to English syndicate.

Lately the mine was under offer to English capitalists. The engineer who examined it, reported, I was told, that it would take £200,000 to set it on a proper basis—this included a heavier pumping plant, active mine development, and the erection of a heavy mill of 200 stamps. This was well and good; but the initial price for the mine was to be £480,000—all in cash. To pay £480,000 for the mine, then to have raised £200,000 working capital, then to have allotted the usual underwriters' commission, would have meant a capital of nearly a million sterling—and, clearly, the Tasmania is not worth that; so the option was abandoned. The mine is, I really believe, a fine one, but it has arrived at that stage when a large amount of working capital *must* be spent on it; and if the present shareholders cannot raise that, they must be prepared to see an end of dividends.

Offer not accepted.

Despite a lot of prospecting work, no continuation of the Tasmania lode has ever been found outside the property of the present mine.

New Golden Gate mine.

The **New Golden Gate** mine is developed to 1,400 feet, this being the deepest shaft in Tasmania. To date, about 180,000 tons of ore have been treated, worth about 70s. a ton, and dividends of about £300,000 have been paid. The mine is easy to work, the ore is free milling, and total expenses are not more than 29s. a ton.

Value of the ore.

Under offer to English capital.

The mine is a puzzling one to describe: there are several reefs, which appear to make, or die out, without any warning. At the 1,300 foot level the mine looked in a poor state; but when the shaft was sunk to 1,400 feet, and a cross-cut put in, two new makes of stone were discovered, and the general prospects of the mine were much improved. In the upper levels there is a large reserve of ore; but it is undoubtedly of lower value than that now being treated, and I think that the average value of the mine is certainly decreasing with depth. This mine, too, was under offer to an English syndicate, but at the ridiculous price of £400,000 –

Most of the smaller English companies are making the usual mistake of erecting machinery before properly developing the mine. This has been proved a suicidal policy in other countries than New Zealand. I suppose of the 48 liquidated companies few had even had a patch of payable ore, and yet nearly all had mills erected.

The different mining districts are Coromandel, Thames, Ohinemuri, in the North Island, and the West Coast and Otago in South. These I will take in detail.

Coromandel district: a complete failure.

Coromandel field was worked for thirty years by local men, before the English companies were floated. The characteristic feature of its mines is small stringers of quartz, which as often as not are in disturbed country. Here and there these stringers lead to a rich patch, and often, from not more than a hundredweight of rock, many ounces of gold have been taken. Such a discovery would make up for months of unprofitable working.

But these rich patches, without doubt, were most frequent near the surface, and below 300 feet or so were few and far between. At the best this is a poor class of mine, but when the rich surface ground has already been worked out, it is almost certain to be a failure. So the English companies found. Of these the **Hauraki** was the only successful one, but it too, having worked out the upper levels, is now in a poor state.

About the Coromandel mines.

Almost all the other mines have now been liquidated. Some propose to take up properties in West Africa, where their last state will be worse than the first. The remaining mines, subject to more liquidations before this is in print, are **Hauraki, Golden Pah, Hauraki Mines, Irene, Kathleen Crown,** and **Royal Oak.** I am afraid none of these mines are any good. Now and then a patch may be discovered, but on the year's work there is a loss.

Near Coromandel are the **Waitaia and Kauri Freeholds**; the latter of these own a lot of land and timber, and produces a little gold, but I do not consider either of them profitable.

Thames field, also a failure.

The Thames field, 40 miles south of Coromandel, had once a great history, but is now practically worked out. Here, otherwise, why in the next few years a number of other payable mines should not be discovered. It is hardly to be expected, however, that English capital will be greatly attracted to new mines here for some time to come. It has had a poor show up to the present, and there are still a lot of worthless mines to be liquidated. Local people may be instrumental in opening up new mines of value. They have in their own hands the gold-dredging industry of Otago, and hydraulicing on the West Coast; in the Coromandel Peninsula, too, they are always at work on small quartz mines. One of these, the Great Barrier, promised to earn profits.

The position of English capital.

Mining conditions.

As regards local mining conditions:—Water is plentiful, also timber and fuel; labour is indifferently good; Government labour regulations are severe, but exemption can be got from the Minister of Mines if there is reason for it. There is the usual colonial tax of 5% on profits. The Government yearly report on the mines is the best of those issued in Australasia.

Gold values.

All assays and returns are made in sterling, not in troy weight or bullion. This sensible custom was introduced because there is a good deal of silver associated with the gold; in the South Island bullion runs up in value to 78s. or 80s. an oz., but in the North it is usually worth only from 10s. to 30s. The bullion of the Waihi is worth less than 20s. an oz.!

Let me call the attention of managers, directors, and secretaries of companies in other parts of Australasia to this point.

A volcanic country.

New Zealand, the North Island especially, is a volcanic country. The whole of the island is of a soft formation, and appears to be continually moving. A drive along a level will not stand without timbering; the roof would keep falling in. This timber, too, has to be renewed from time to time, and tracks along the floor relaid. This is a matter of some expense.

Metallurgical progress.

The metallurgical treatment of North Island ores, where they are usually refractory, is not yet on a definite basis. The Waihi has only just introduced wet crushing. For years it was thought that the gold was in much too fine a state to allow of this. Some mines still crush dry. Apparently the ordinary wet crushing and cyaniding can be adapted to most of the ores.

been extended; several of the chutes have taken on a different angle of dip, and so on. I myself do not carry in my head a distinct plan of the mine as it has evolved up to the present. But I do know without question that it is a better mine to-day than it was three years ago, and it is only second to Mount Morgan among all Australasian gold mines.

Compared with three years ago.

The ore developed now is much; but that in sight is far more still. I place the total at well over a million tons. When I inspected the mine, the cross-cut at the fifth level was just being driven. An aggregate width of ore had been passed through of 80 feet, and one-half of this was reported as payable. This indicated that new ore lenses were making at this level. Since then these new bodies have been opened up extensively, showing high values, and adding very greatly to the size of the mine.

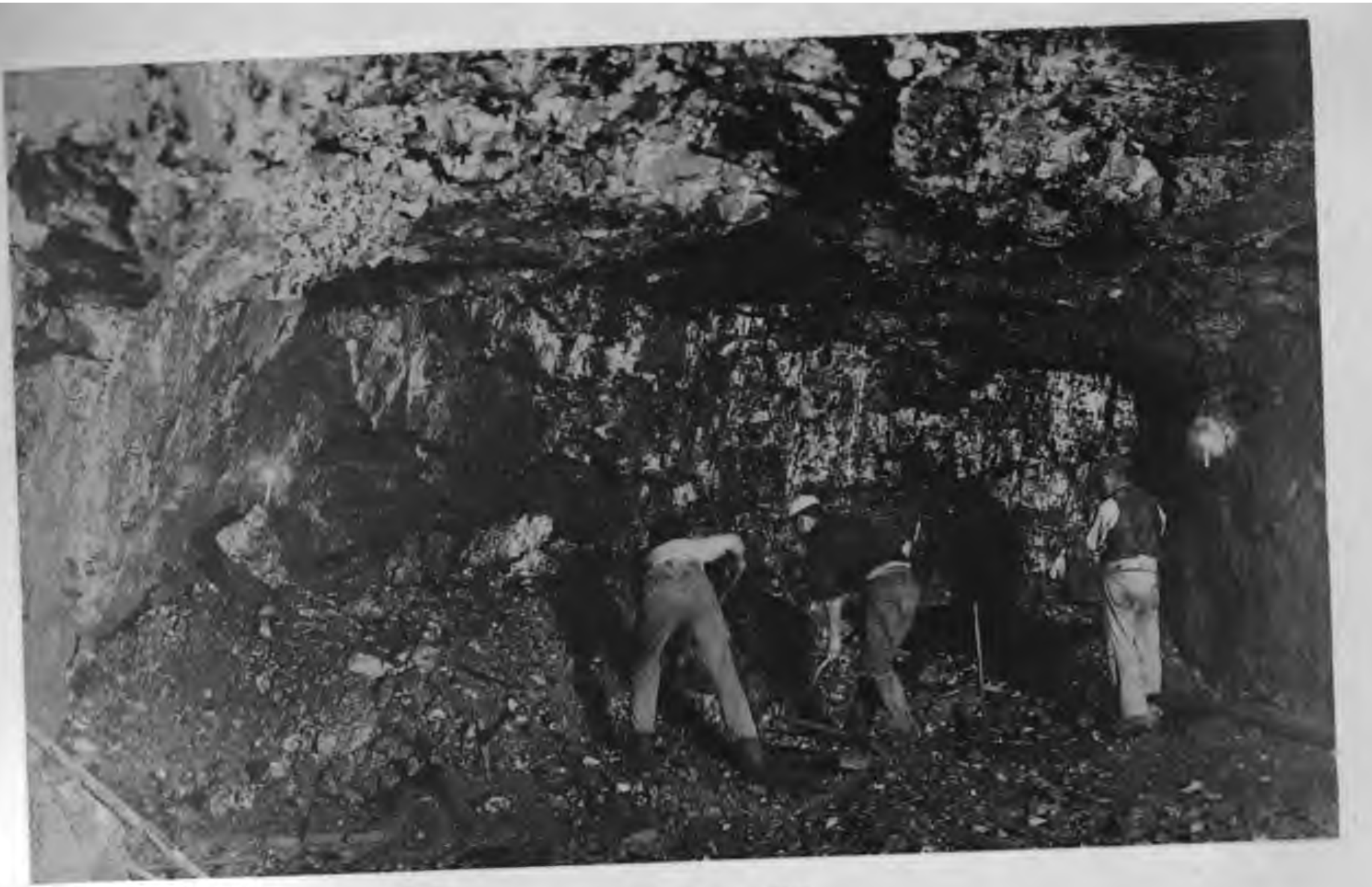
Ore reserves.

Here is a mine with an ore chute in places 2,000 feet long, with five or six ore bodies, some of which are almost immense, and with ore reserves for many years ahead. It is as yet only opened down to 500 feet or so. Of course a mine is at its best at some one point, and this splendid fifth level of the Waihi may be its best point. But suppose that it is not? Many ore bodies [illegible] Why should not this one? [illegible] too much to expect that the Waihi should hold good [illegible] such a mine as the [illegible]

[illegible] this mine should easily [illegible] I endorse. Until that [illegible] as working at less [illegible]

[illegible] 2,000 at Waikino. [illegible] was introduced. [illegible] for a mine of [illegible] added to the Waikino mill [illegible] monthly yield of £5[illegible]

On a [illegible] the value of the ore to fall to 48s. a ton; at present [illegible] Total costs on this



J. J. Petter, Photo., Mount Eden

STOPE IN WAIHI MINE.

basis should not be more than 22s. a ton, and might be lowered to 20s. This would leave 26s. a ton profit.

Capacity of the mine and probable profits.

Finally, I believe the capacity of Waihi to be this :—

Ore treated monthly	... ...	21,000 tons.
Yield, at 48s. a ton ...	... ...	£50,400
Cost, at 22s. a ton ...	... ...	23,100
	Profit ...	£27,300
Yearly profit ...	... ...	327,600

Equal to over 60% on the capital.

The mine has been always handled carefully both by the management and directorate ; but a weak spot has been the amount of money advanced to finance the **Union Waihi** Company. When I saw this mine I thought very little of it—an opinion backed by the men who had developed the mine. The prospects of the Union Waihi were never good enough to warrant so much money being spent on it.

Waihi Grand Junction. (Issued capital, 170,000 £1 shares.)

Waihi Grand Junction. This mine has two leases, one of which joins on to each end of the Waihi. The Waihi lode, therefore, runs through all the ground of the Grand Junction, and as it has been already proved payable to within a few hundred feet of each boundary, prospects of the latter mine can be estimated. The main ore chute of the Waihi seems to be dipping into the north lease of the Grand Junction, and if it continued would enter its ground at a payable depth. On this north lease, when I was there, the lode had been cut at 500 feet. It was a big ore body, but being far above the line of the chute, was of low grade. Heavy water was met here, and the mine was for a long time shut down. In time when this shaft has been sunk further there will be a good chance of finding payable ore.

Will probably be absorbed by Waihi later on.

On the south lease, a shaft is sunk within 30 feet of Waihi boundary. Here patches of pay ore were found, but the ground was much disturbed. As the general trend of the Waihi chutes are to the north, I hardly expect much from this lease. Of course, a new chute might be found here, but I do not ink so.

The speculative chances of Waihi Grand Junction are first-rate. There is quite a probability of the mine being absorbed by the Waihi. The price to be paid in such an event would be, I think, well over £1 a share. In any case the shares are among the best purely speculative ventures that could be named.

Waitekauri:

A few miles from here is the **Waitekauri.**

The dangers of mining are shown full well in this mine. When I saw it in 1898, its prospects were of the best. The first level had payable ore for 1,000 feet in length. The second showed 520 feet of good ore, with the face still showing well. The third was opened just after this, still in good ore.

gone wrong in depth.

But the ore chute went wrong altogether below that; the ground opened in the bottom, at the time of writing this, is unpayable. The good ore exposed in the upper levels has been nearly all worked out, and the outlook is as bad as it can be. There is a chance, just a chance, that the ore chute will make again, but the balance of experience is against it.

New Waitekauri Extended.

New Waitekauri Extended. Since I saw this mine I have always had the idea that it might be made to pay. But not in the way it has been handled. Its money has been frittered away on a mill and aërial tramline, when it should have been spent solely in mine development.

Here is a mine with a great body of ore. It is 20 to 30 feet wide, and proved over a big area. The then manager told me positively that a good deal of this was worth 30s. a ton; it is not refractory, and at even a lower figure ought to be profitably worked.

But the company's funds should have been spent in exploiting this ore—finding out how much there really was of payable value—not in rushing up machinery and tramways. It is not a mine that can be worked on a small scale. Development should have gone ahead till there w [illegible] doubt of the existence—if it does exist—of a big body of [illegible] and then a large mill—driven by steam power—sho [illegible] the very mouth of the tunnel—a natural

I may be wrong in attributing payability to this mine, but as yet it has never been proved either one way or the other.

Waitekauri Cross and N.Z. Jubilee.

The **Waitekauri Cross** and **N. Z. Jubilee** in this neighbourhood are, I think, no good.

Komata Reefs.

Komata Reefs. The problem before this mine, when I saw it, was to drive a tunnel 3,000 feet to get several hundred feet of 'backs' on the reef which had already been worked down to the level of the tunnel above that. But this reef, at best, is only three feet thick, with an ore chute 200 feet long. The mine has been a well-handled one, but I cannot see that its prospects are good.

Karangahake mines.

At Karangahake in this district, are three mines, the N. Z. Crown mines, Talisman Consolidated, and Woodstock. These reefs are inter-stratified veins of great persistence, both laterally and in depth, with an average width of 3–4 feet, and gold contents distributed rather evenly. Owing to the steep contour of this mountain through which they run, it has been possible to expose a great depth on these veins by adit tunnels. At these lowest points the same conditions as to width and value are maintained. It may be said without doubt that these reefs show a great tonnage in sight; as to the value of this, a quite large proportion seems to be payable.

N.Z. Crown mines. (Issued capital, 200,000 £1 shares).

N. Z. Crown mines. The reef worked by the Crown mines crops out at the base, and up the side of a mountain into the heart of which adits have been driven a distance of over 2,000 feet. Below water level, again, a fine shaft, 29½ feet within timbers, and containing powerful pumping and hauling gear, is being sunk on the reef at an angle of 50°. A central compressor, driven by water power, is used for both hauling, pumping, drilling, and ventilation, and is economically a success. The reef is 3½ feet wide. There are several hundred thousand tons exposed by the adit tunnels. A great deal of this is payable ore.

There are 60 stamps, crushing about 33,000 tons a year. The recovery is about £2 a ton. On this a profit of rather over 5% on the capital is earned, and paid in dividends. I had thought that by this time 20 more stamps would have been erected; but I believe the present return can be kept up for a good many years.

This is a well-managed mine.

Talisman Consolidated. (Issued capital, 202,000 £1 shares.)

Talisman Consolidated. Here again is a mine which, by means of adit levels, has exposed a very large tonnage of ore, and has erected 70 stamps to treat this. The value of the ore in this mine, I believe, is good. As I crawled through the stopes I got that impression. I assume that much of the ore in sight is payable, which would give several hundred thousand tons as a reserve already in sight. I cannot estimate what this mine is likely to yield, but I would place the ore as of higher average grade than the adjacent Crown mines.

It is an unfavourable feature about the Talisman that it is puffed so noticeably in several financial papers. *A good mine needs no push.* But in this case I am willing to believe that those controlling the mine really believe in it.

Woodstock. So far this mine is a disappointment. In its earlier days all the richest ore was picked out, and money was squandered over useless metallurgical processes. No doubt the average value of the ore in this mine is poorer than in the two that adjoin it, but I do not think its position a hopeless one.

West coast mines.

On the west coast of the South Island there are such hand-to-mouth concerns as the **Collingwood, Taitapu Estate, and Golden Blocks (Taitapu).** I am afraid these are not much good.

[illegible]

In the Reefton district are found the subsidiary companies of the **Consolidated Goldfields of New Zealand.** That corporation floated off the Progress, Welcome, and Humphrey's Gully mines, and is itself working the Wealth of Nations and Golden Fleece claims. These two latter are now producing gold. In each there is some payable ore in sight, but not enough to yet justify their flotation.

The Consolidated Company holds, in addition, the controlling interest in the shares of its three subsidiary mines.

OLD BATTERY AT PROGRESS MINE, SOUTH ISLAND, N.Z.

fluming—with poorer ground to be worked on the head of it—is likely to bring this industry to a natural end before long.

There remains only the Otago district. Here dredging for gold in the rivers is the main thing: it has been successful, but is now quite overdone.

Otago dredging industry.

The yield from Otago dredges to date is about 150,000 ozs. of gold. A yield of 6d. to the cubic yard of sand pays well, but only the dredges located on the richest stretches have been successful.

Otago quartz mines.

In the mountains of Otago are some small quartz mines owned by English companies. Of these the **O. P. Q. (Waipori)** is the only one worth mention. It will be a small gold-producer; as yet there is no evidence that it will be permanently good.

The Blue Spur and Gabriel's Gully is an hydraulic mine here which earns enough to pay 8% on its 26,000 preference shares, and a small dividend on 104,000 ordinary shares.

New Zealand mines worth watching.

The mines worth watching in New Zealand are—

Waihi.
Waihi Grand Junction.
Waitekauri.
N. Z. Crown mines.
Talisman Consolidated.
Progress.
Consolidated G. F. of N. Z.
New Inkerman.

New Guinea.

Report of gold ore exaggerated.

New Guinea is now referred to as a coming gold producer of importance; but my information is to the effect that, as usual, the value of the discoveries is greatly exaggerated. On the mainland, neither in German, Dutch, nor English territory have reefs yet been found. From time to time parties of diggers from Australia, some hundreds in all, have prospected the river beds and valleys, and from these sources, or by purchase from the natives, have gained a fair amount of alluvial gold. But half of these men have died from fever, or have been killed for the table by the natives, and at present prospecting is not making much progress. Whatever be the value for the mainland, as a gold producer, it lies ahead; as yet no accurate forecasts can be made.

Woodlark Island.

The present headquarters of gold mining in New Guinea is on Woodlark Island, which lies off the extreme S.E. corner of the mainland. Here live, or in the fever season die, some hundreds of whites, and native workers are brought over on contract from the mainland.

The **Woodlark Island** mine is supposed to be a dyke, carrying gold. Its width is reported as going up to 20 feet or more, but it is quite certain that only two or three feet carry payable gold. Opinions as to its value differ greatly; in any case hardly any development has been yet done. A mill is being erected to crush from this unproved mine.

Kulamadou.

The adjoining mine to this, working the same lode, and owning the deep level of part of the Woodlark Island, is the **Kulamadou.** Here also development has not yet had time to prove anything definite.

Woodlark Ivanhoe.
Suloga

The **Woodlark Ivanhoe,** another unproved mine, is erecting a mill, and the **Suloga** Company is building a dredge for the alluvial sands.

Conclusions.

It will be seen that everything is as yet supposititious; no ore in sight; no definite reports to hand; and as this sort of thing has been going on for several years, my experience tells me that all is not right with the Woodlark Island mines. On a neighbouring island, Missima, there was some prospecting, but nothing of value has been found.

CHAPTER VIII.

THE GOLD MINES OF INDIA AND THE MALAY PENINSULA.

India.

THE principal gold mines in India are situated in the Kolar district of the native State of Mysore. The boundary line of the Madras Presidency is only a mile or two distant, and, as the gold bearing formation continues in that direction, the most southerly mine of the group is actually situated in Madras. The mines are connected by a short branch with the Madras-Bangalore line, and can be reached by rail from either Bombay in forty hours, Madras in twelve hours, or Tutecorin in thirty hours. The country surrounding the mines, which lies at an elevation of 2,800 feet, possesses few features of interest; the blue outlines of mountain ranges are visible in the distance, but the near neighbourhood shows only an undulating, uncultivated tree-dotted expanse, in contrast to the luxurious foliage and well-tilled paddy fields of the lower-lying ground of Southern India. The climate is fairly good, although mild forms of fever and ague are common, but Europeans run a risk from the epidemics of cholera and small-pox continually breaking out among the native workmen.

Location of the Kolar Goldfield.

Number of mines and stamps.

There are sixteen mining companies at Kolar, and there are at present over 600 stamps at work. The central three or four miles of reef presents almost as crowded and busy a scene as a like section of the main reef near Johannesburg, although the substantial stone chimneys and red tiled roofs are in contrast to the smoke stacks and everlasting galvanised iron of South Africa.

Geological.

The 'Champion' lode.

The West Reefs.

As regards the geology of the field, the formation in which the reefs are found is a bed of schistose rock, which is about fifteen miles long. In the centre, this bed is from three to four miles broad, but towards each end it tapers down to a much narrower width, and finally disappears. This bed of schist is surrounded by granite, so that the entire area of the field can be easily determined. A curious feature of this schist formation is that at one side it dips east, at the other side west, while in the middle it lies vertically. It is, I think, quite certain that the main or 'Champion' lode is a fissure vein. Although in places considerably cut up by dykes and faults, it holds its course in depth with regularity, and throughout probably averages four feet in width, with a dip of from forty-five to sixty degrees. To the north and south extremities of the field the lode splits up into several sections, and these, although carrying gold, are treacherous and irregular. Then, again, there is a series of reefs 3,000 feet to the west, known as the West Reefs. Several of these are worked by different companies, but although well-defined and regular bodies, they have not yet been found payable.

Description of different reefs.

To summarise the reefs, there are:—Firstly, the main or 'Champion' lode on which the richest mines are situated; secondly, the branch sections of the main lode, payable in places, but not regular in gold contents; and, thirdly, the West Reefs, which, so far, have not been found payable.

Ore chutes.

The payable gold always occurs in chutes. For example, you may drive for 300 feet on a well-defined reef that only carries 1 dwt. of gold to the ton; the next assay will give 1 oz. to the ton, and without any visible change in the nature of the reef, you will find yourself in rich chute ore. This may continue for 100, 200, or 500 feet, when the gold will give out as suddenly as it came in. These chutes can generally be relied on to continue in depth, but instead of going straight down, they and their nature.

always dip rapidly to the north. The consequence of this is that a chute of ore discovered near the north boundary of a mine is of comparatively little value to it, because at a depth of a few hundred feet it will probably have dipped entirely into the next property. Although the chutes usually hold to a considerable depth, this is not always the case. Some valuable chutes, which were worked for years, have now given out. On the other hand, some of the deepest workings on the fields show the chutes to carry a good value. I think that on the central section of the lode the chutes will probably continue payable to a depth of well on for 3,000 feet on the incline.

Ancient workings.

The commencement of modern mining in the Kolar district, which dates from about 1880, was due to the discovery of ancient workings, many of which can still be inspected. The ancients prospected about on the surface outcrops till they came upon a chute of rich ore. This they would work out, with their rude appliances, actually to a depth of 150 or 200 feet. The method employed was evidently to heat the ore by means of a fire, and then to throw cold water upon it. After this it was rendered more friable, and could be worn away by being hammered with pieces of a harder rock. More strange than this must have been the methods used for getting rid of the big flow of water that would be encountered in depth, and especially for keeping the water away from the fires. Large gangs of workmen must have been employed to continually bale and pass up vessels of water to the surface. As if to bear out this, I was shown an old working in the Coromandel mine in which were the remains of hundreds of old vessels for carrying water, while series of niches, evidently to hold the feet of the workmen who were baling and passing up the water, were cut in the footwalls.

The ancients' method of working.

The present system of working.

I spent two weeks at Kolar in 1898 inspecting every mine that was at work, and have since then followed closely the development of the field. Although I do not think that in every case the best methods for the cheap extraction of gold are employed, yet every mine on the Kolar field, successful or not, is at least an honestly conducted, legitimate mining venture. The chief defect in the system of working is a lack of centralisation of machinery and plant. The reason for this is the uncertainty as to the future which prevailed until a few years ago, and the gradual manner in which the plant had to be increased to meet the growing requirements of the mines. For example, several of the largest mines possess three mills. Each mine has from three to five hauling shafts and from three to five air compressors, and several stone-crushing stations. Separate boiler plants are required for most of these. The result of this is increased costs in fuel and labour. I do not think that anyone can be blamed for this state of affairs. In the bigger mines it is now being gradually remedied, but, in the meantime, it means much higher costs for working.

Lack of centralisation.

No system of keeping mining costs or analyses of expenditure.

Another defect, to my mind, is the way the accounts are made out. The reports issued by the different companies are exhaustive, except as regards the details of expenditure. In the Mysore report for 1900, for example, you have the bare statement: 'Wages and Material, £121,747'! Nowhere is this analysed under different headings. The other mines are equally lacking in analyses of expenditure. In gold-mining accounts a separate statement of working costs should always be given, and a minute analysis of expenditure, worked out to the ton milled, should show the cost of every material and process employed. Without this system of accounts for the Kolar mines the full value of centralisation of plant will not make itself apparent. Again, there is the hateful use on this field of the long ton, viz., of 2,240 lbs., instead of the decimal ton, of 2,000 lbs. The latter is the measure now in use in all the most advanced mining countries. Why do not the directors of the Indian mines decide to use it in future?

Management.

Speaking generally, the management of these mines is of a good standard. The directors, too, I believe to be more scrupulous than is usually the case with mining directors. Combining these two factors it may be said that shareholders in the Indian mines are dealt with justly—which they no doubt appreciate.

Working costs.

For reasons already stated, it is difficult to get at the exact working costs of the mines. In the bigger mines they vary from about 34s. to 45s. a ton of 2,240 lbs., but one is not given an opportunity to analyse the figures.

White labour.

White labour is not a heavy item; there are few whites underground, and these are mostly Italians, who go out on contract at from £6—£8 a month.

Native labour.

Black labour, at the first glance, seems to be cheap. The average native receives from 5d. to 8d. a day, and natives at about this rate of wage are employed to work rock-drills, to blast, to drive engines, and, generally, to do all sorts of work that in other gold-mining countries could only be entrusted to white men. All stoping is let by the fathom to native contractors, so that the responsibility of a regular supply of labour falls more on the contractors than on the company; there is no scarcity of native labour however. With all this, native underground labour is not cheap. The rock-drill men show no ability to save dynamite, the ordinary hammer or stope native does not get through half the work of a Rand Kaffir, while one and all need the closest supervision or they would not work at all.

Timber.

Timber has to be used in quantities in all the mines, and is an expensive item. It is brought from Calicut on the west coast, some of it, especially the teak wood, being among the hardest of all timbers.

Coal.

Coal is, relatively, the heaviest item, and its cost probably ranges from 5s. to 10s. per ton of ore milled. Bengal, Hyderabad, Australian, and English coals have been tried, costing from about 24s. to 35s. per ton delivered. In future the Hyderabad coal will probably be used. Dynamite, owing to the great hardness of the rock, and to the want of skill of the native workman, is a moderately heavy item. All the mines are supplied under one contract. The contract price is about 70s. a ton for dynamite; for gelignite it is correspondingly less. The average cost, per ton milled, works out at under 3s. The scarcity of the water supply forms a serious question. Several of the larger mines, notably the Mysore and Champion Reef, have at times barely enough water to keep their stamps at work. Cyanide treatment is cheap. Tailings can be screened, filled into tanks, and emptied for 4d. per ton. The extractions are fairly good. The Mysore Company has erected a large plant to treat slimes and residues, which assay only 2 dwts., and a profit is made on this. To secure good cyanide extractions, it is necessary to use a screen in the battery of at least 1,200 mesh. Shaft sinking is carried on at the rate of fifteen to twenty-five feet per month. The excuses offered for this low standard of work are hardness of rock and climatic effect upon the white miner, but there is room for improvement. The estimate by the Nundydroog Company for a shaft 1,000 feet deep, timbered, and fully equipped with hauling, pumping, and rock-drilling machinery, is Rs.326 per foot (£21. 15s.).

Dynamite.

Water.

Cyanide.

Shaft sinking.

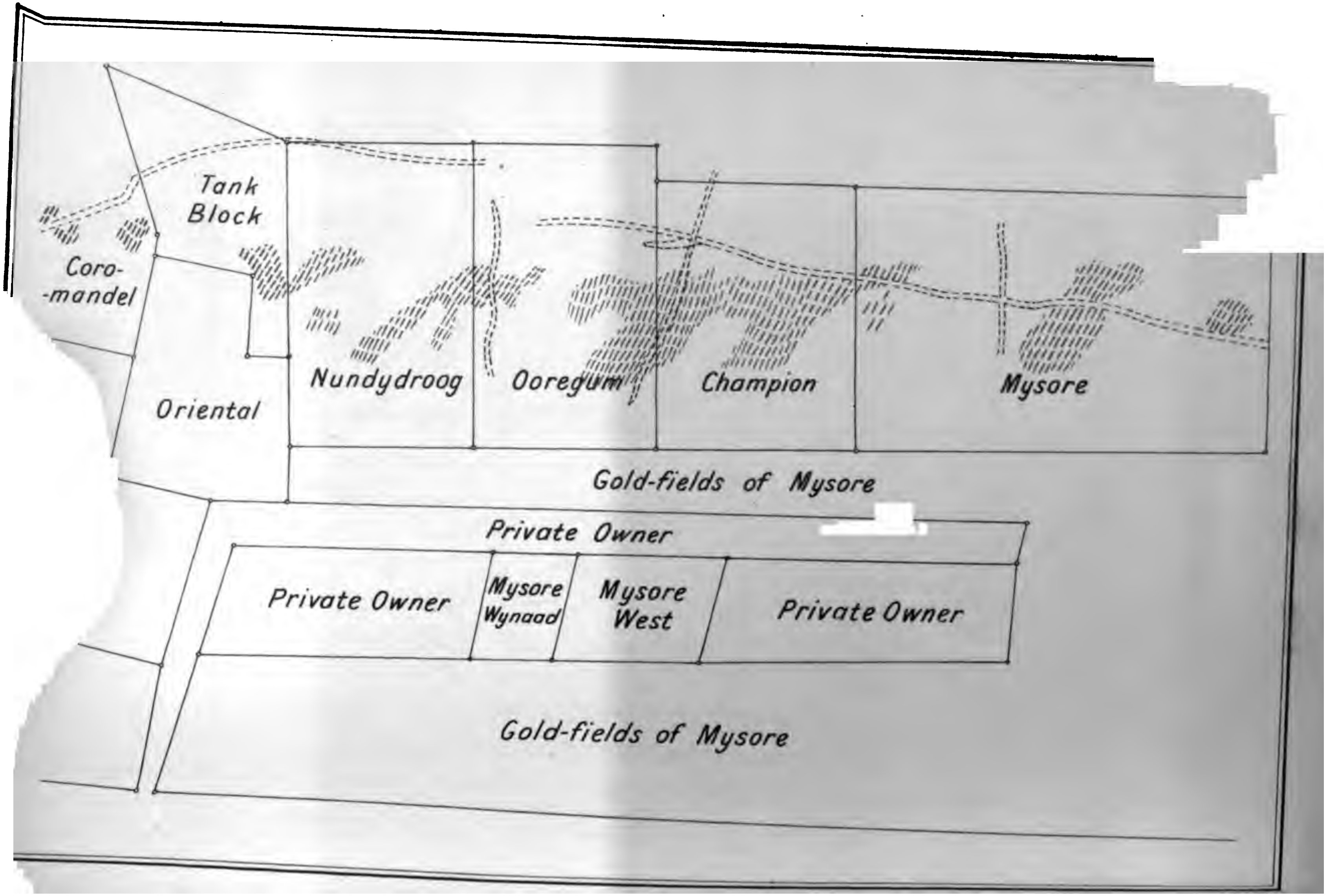
STATEMENT SHOWING THE TONNAGE CRUSHED, YIELD OF GOLD, AND WORKING COSTS PER TON OF 2,240 LBS.—EXCLUSIVE OF ROYALTY AND EXPENDITURE ON CAPITAL ACCOUNT, BUT INCLUDING EXCESS DEVELOPMENT, OF THE FOUR PRINCIPAL INDIAN MINES OVER TWO DIFFERENT PERIODS.

		Name of Mine.			
		Mysore.	Champion Reef.	Ooregum.	Nundydroog.
For Years 1896-7 ...	Tons crushed	64,297	87,772	63,888	39,490
	Yield per ton	132/4	102/3	77/–	85/1
	Cost per ton	41/9	37/1	41/–	33/7
For Years 1900-1 ...	Tons crushed	116,576	112,540	74,867	37,460
	Yield per ton...	108/7	107/3	83/5	97/5
	Cost per ton	34/8	43/1	41/10	48/7

NOTE.—Mysore having centralised its plant and increased its stamps has reduced costs materially. It is intended to increase the stamps again. This will result in a further lowering of costs, but the grade of ore treated will also fall off.

When the new main vertical shaft of Champion Reef is at work, and the stamping power more centralised, there will be a material decrease in working costs.

The higher rate of costs at Ooregum and Nundydroog in 1900, was partly due to increased treatment of tailings and increased expenditure on new main shafts and extra mine development.


Tank Block
Coro- -mandel
Oriental
Nundydroog
Ooregum
Champion
Mysore
Gold-fields of Mysore
Private Owner
Private Owner
Mysore Wynaad
Mysore West
Private Owner
Gold-fields of Mysore

Legislation.

The mines of the Kolar field, lying as they do in the native State of Mysore, come under the government of that State. The ground on which the mines are is part of the area of a concession granted by the Mysore Government to certain parties about 1881. The royalty to the Mysore Government from this concession was fixed at 5% of the gross yield, and the period of the concession for thirty years; it will, therefore, be seen that the leases of all the mines on the Kolar field have only nine years to run. At present, the royalty paid yearly to the Mysore Government from the Kolar mines is about £85,000, besides large indirect receipts from railways and from the subsidiary industries the gold mining has brought into existence. It has been recently notified that the leases will be renewed for a further thirty years. The terms to be imposed by the Government for the new leases are to be 5% of gross yield as before, plus an extra 2½% on dividends.

Royalty to Mysore Government.

Mysore Government Regulations.

Classification of the Kolar mines.

And now as to the value of these mines. On the main, or 'Champion' lode are located the Mysore, Champion Reef, Ooregum and part of the Nundydroog, and the deep level ground of these is owned by the Goldfields of Mysore. This is the really good area. I take it that mining speculators need not bother much about anything outside it. To the north of this, on the branch sections of the main lode, there is good ore showing at present in the Kennedy's section of Nundydroog, and in Balaghât, but the ore chutes on these branches are too irregular to rely on much.

On the branches of the main lode, and on the west reefs, the mines are part of Nundydroog, Mysore West and Wynaad, Coromandel, Balaghât, Road Block, Oriental, Nine Reefs, Kempinkote, Mysore Reefs, and Yerrakonda, but with the two exceptions mentioned there is no really payable ore being opened in any of these.

Trend of the ore chutes.

On the main lode the rich chutes invariably dip to the north. The chutes once worked in the north end of the Mysore passed into the Champion Reef; and a big chute in Champion Reef, which a year or two ago passed into Ooregum, improved the prospects of that mine greatly; still further north the good ore passed out of Coromandel into Balaghât. A reference to the accompanying map will show the tendency of these ore chutes; it should be studied rather carefully.

The four principal mines on the main lode are doing very well indeed at present. In each there is ore developed—of equally as good value as that now being mined—for several years ahead, and the bottom workings, on the whole, look well. The yield on the shares of these four mines now averages about 10%.

Average yield of the principal shares.

The mistake of buying a mining share to yield only 10 per cent.

That is one side of the question. Three years ago, when I had seen far fewer mines, and had still a few illusions left, I was satisfied to place Mysore and Champion Reef on a 10%, and Nundydroog and Ooregum on a 15% basis. But I know now that no gold mine in the world, unless the ore is practically all in sight, is worth buying into on a 10% basis. What does this basis mean? It means that the investor does not get his original capital back for 10 years, and that at least 15 years is required to pay off both capital and interest. These Indian mines have ore reserves averaging 2-3 years ahead. To this may be added a like quantity as being ore in sight, but not actually blocked out. The investor has therefore security for five years' profits, and has to take the risk of payable ore being found to last for another 10 years after that. Looked at as a genuine investment it is not good enough. Many people will reply to this that the permanence of these mines in depth is quite assured. To this I answer, and I give several hundred examples in this book to prove it, that the permanence of *no* mine is proved one foot beyond what can actually be seen. These four Indian mines are far and away sounder than the average property, and I believe that the evidence is in favour of the reef continuing payable to perhaps 2,500 or even 3,000 feet on the incline; but even then, on the basis of ore in sight, they ought to yield the investor more than they do now. It is the fate of every chute of ore in the world to go wrong at some depth or other. How many have even lasted to [illegible] in these mines? The

Mysore mine, so far, is the deepest on the incline of the reef, and in this mine, below 2,000 feet, there is a distinct falling off in value. I do not say that there is any sign of the mine coming to an end, but I certainly believe that the mine was, and is, better above 2,000 feet than it ever will be below it. I believe that when the other mines reach the present depth of Mysore, they, too, will find a falling off in gold contents. These mines have worked their richest ore—it is not before them; they are getting to a great depth; and there is the evidence of the whole world that ore chutes get poorer and poorer, even the best of them, and finally die out. That is the other side of the question. Looking at it from that side, I have to say that these shares are now standing at more than their intrinsic value.

Intrinsically, these Indian shares are no over-valued.

Mysore mine

Mysore.—The future of this great mine—assuming that about four years' reserve of ore is now in sight—depends chiefly on the continuance in depth of the ore chutes in the central section of the property, which are worked from Ribblesdale's, Crocker's and Rowse's shafts. The deepest workings here are now about 2,500 feet on the incline. Below 2,000 feet, or perhaps 1,900 feet, although the reef continues regularly, there has been a marked falling-off in its value. Much of the ore is unpayable; a good deal is of a value that will only yield a small profit, and the richer patches are neither so large nor so regular as they were at shallower levels.

Value of the main ore chutes in depth.

To partly neutralise this falling-off, a further 60 stamps are being put up—making 210 in all. This will reduce working expenses, and allow of a lot of low grade ore, that is now just unpayable, being worked at a profit, but the yield per ton will come down, and the gross profits must also after a time fall off.

It is, of course, possible that this main chute may at a still greater depth again improve to its former value, but the evidence of all mining is against this. It must not be imagined that this main chute is really coming to an end, but the evidence leads one to think that it is gradually getting poorer. The new Edgar shaft, a vertical circular shaft now 800 feet deep, is being sunk on the dip of this main chute, and will intersect the reef at about 2,500 feet vertical. Beyond that is still some distance to the boundary of the mine, then comes the deep level area belonging to the Goldfields of Mysore. Besides this central section of the mine, there is the section in the north end worked from Gilbert's and Tennant's shafts, and that in the south end, worked from McTaggart's and Schaw's shafts. These are, relatively, not so important as the central section.

Gilbert's section.

The Gilbert section shows a narrow reef, averaging probably 8–9 dwts. In the bottom workings from Tennant's shaft, at about 1,100 feet, a new ore chute of value is being opened up. This promises to be an important addition to the life of the mine, and has raised the intrinsic value of the property higher than it was a year ago.

McTaggart section.

In the McTaggart section all the deepest points show unpayable ore.

There has been a big reduction in working costs at this mine of late years, and a still further reduction is in sight. Good management, however, cannot put more gold into the rock, and on the present basis I think the shares as an investment are too high.

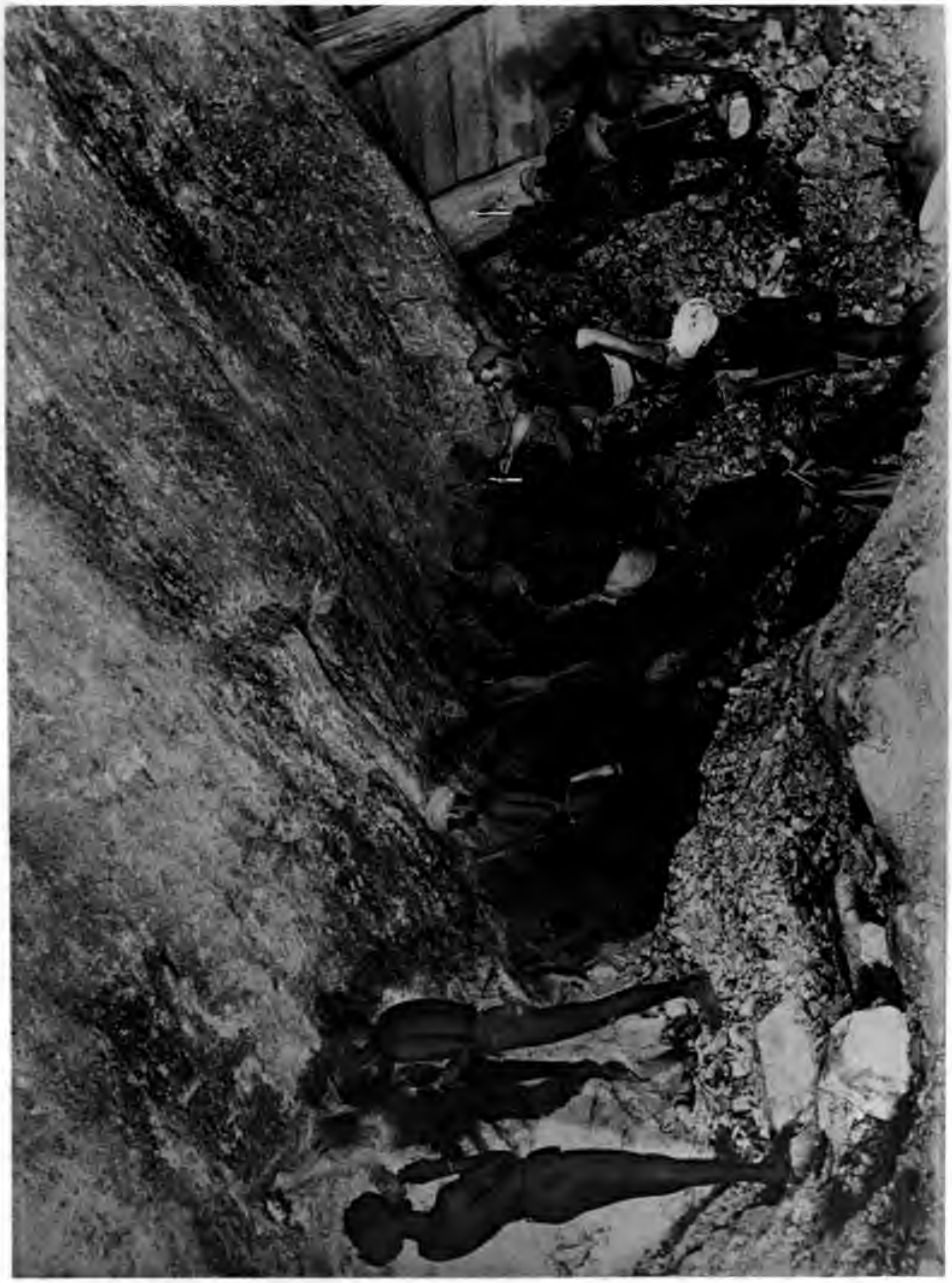
Champion Reef.

Champion Reef.—The amount of ore in sight may be placed at three years' work. In this mine none of the workings have yet reached 2,000 feet on the incline, so that, as regards ore exhaustion, it has several years' advantage over Mysore, where the workings are deeper.

The Champion mine looks well in the lowest workings. In the bottom of Garland's shaft, at 1,900 feet, good ore is showing.

Ore values in depth.

The principal chute in the mine, that tapped by Ribblesdale's shaft, shows no falling off, and is now proved to 1,800 feet. This chute, if it holds down deep enough, will eventually dip into Ooregum, in the same way as the chute once worked from Carmichael's and Rowe's shafts has done. Of this latter, a tail end still remains in Champion, but at a level or two deeper it will have dipped entirely into Ooregum.



Reduction of working costs.

Nevertheless Champion Reef looks well. I consider it to-day as good a mine as Mysore. With its new central mill, and new main vertical shaft, it will soon show a considerable reduction in working costs; which are now too high. This mine, too, as well as the rest, will benefit from the coming introduction of electric power from a central station at the Cauvery Falls.

Value of the shares.

But although this is a great mine, the shares are not good enough to stand on a 10% basis. As a speculation they may even go up, but as an absolute investment they are too dear to buy. There is ore in sight for three years; but it will take fifteen years' work to pay off capital and interest, and it is not certain that the mine can earn big profits for so long as that.

Ooregum.

Ore in sight.

Ooregum.—The original pay chutes in this mine gave out at a shallow depth, but at about 1,200 feet a new chute dipped into the mine from the Champion Reef. This chute is still good at 2,000 feet on the incline; naturally, too, it is wider, as more of it is now inside the Ooregum boundary. Even yet the Ooregum has not got the full benefit of this chute: at the 2,110 foot level it should have dipped entirely into Ooregum. On this chute it is quite safe to assume that good ore will be found—including present reserves—for three or four years. At a still greater depth it is probable that another chute will come into the mine from Champion Reef, but the value of this at such a depth is problematic.

The East Reef.

Value of the shares.

In what is called the East Reef—a branch vein lately opened from several of the shallower levels—the mine has an asset that may develop into something of importance, but, outside of that, all the future of the mine seems to lie in the south end, next to the boundary of Champion Reef. The future is quite assured for some years to come, but on a strict investment basis the shares are too high.

Nundydroog.

In the **Nundydroog** mine two reefs are worked. At the south end the workings are on the main lode, and in the

The Main lode.

north end on the branch of the main lode. The central part of the mine carries no ore. At the bottom of Taylor's shaft, on the main lode, the ore is now poor, as it is also at the bottom of Main shaft. The principal ore chute in the mine, worked from this shaft, is dipping fast to the north, to reach it a lot of dead work is now necessary, and it is important that the new main vertical Richard's shaft should reach this as soon as possible.

The branch lode in depth.

On the branch lode there has been a notable improvement, which I did not expect. At the 1,100 foot level the chute seems to be about 1,000 feet long. This is much more than it was higher up; indeed, for several levels it had died out altogether. I do not consider the chutes on this branch lode at all regular as a rule, and this discovery may not continue to a great depth, but it certainly has improved the prospects of the mine.

Value of the shares.

I suppose there is three to four years' ore in sight in Nundydroog, and the immediate outlook is good. But I do not see an assured future for many years ahead, and on a strict basis the shares are now standing too high.

Goldfields of Mysore.

A valuable deep level area.

The immediate deep level area of these four mines belongs to the **Goldfields of Mysore.** It has other ground, too, on the west reefs, but this I consider of no value. Theoretically, this long strip of deep level ground is very valuable. The ore chutes may not go down payable to such a depth—say 3,500 to 4,000 feet on the incline—but until this is actually proved by the mines, the ground has a decided market value. I suppose that the four outcrop mines would even now buy this ground, and every year its value becomes greater. The company should stop working the west reefs, which yield no profit, and use any funds it may have in nursing these deep levels. I consider Goldfields of Mysore shares at present prices a good speculative venture.

The smaller mines of the field

Of the other mines on the field I shall not say much. On the branch section of the main lode are Tank Block, Mysore West.

Mysore Wynaad.

Oriental, Coromandel, and Balaghât. Each of these mines has had patches of payable ore, but these were irregular in value, Tank Block belongs jointly to **Mysore West** and **Mysore Wynaad,** but I consider the ore in this mine will yield no real profit. These mines each own areas on the dip of the main lode, which have a certain value as very deep levels of the big mines, but I think the shares of each have no great intrinsic value.

Oriental.

The deep level of the Tank Block itself belongs to the **Oriental** mine, which has done a lot of development on the reef. The results have been unpayable.

Coromandel.

Balaghât.

Coromandel now shows little payable ore. The best chute dipped into **Balaghât,** and in that mine at present the outlook is better than it has ever been. No doubt payable results are assured for several years ahead, but I do not think the shares are worth buying.

Road Block.

Nine Reefs.

On the west reefs are **Road Block** and **Nine Reefs.** Road Block at one time showed some payable ore, and looked as if it would turn out well. But the value did not last. Nine Reefs is a poor mine.

Kempinkote.

Mysore Reefs.

Yerrakonda.

At the south end of the field are **Kempinkote,** which has now taken up a property elsewhere to develop, **Mysore Reefs** and **Yerrakonda.** All of these mines are shut down.

Other Gold Mines in India.

In other parts of India are the **Wondalli, Mysore Harnhalli, Mysore Nagar, Chota Nagpur,** etc. I do not think any of these have been proved definitely payable.

Malay Peninsula.

Gold mining in Pahang.

Malay Peninsula.—The Southern half of the Malay Peninsula consists of the States of Perak, Selangor, Pahang, Negri Sembilan, and Johore. These States are justly famous as producing nearly two-thirds of the world's output of tin; but it is only in Pahang, so far, that gold has been worked to any extent. On the borders of Negri Sembilan and Johore, one or two gold mines are being started on a small scale, such as the **Cherubang** and **Chindras** Companies, but other than this I do not know of the definite location of gold anywhere except in Pahang. To the North of these States, in Kelantan and other of the independent Malay States, and right on as far as Siam, there are mysterious tales of great gold deposits, but I place no reliance in them.

Gold mining in the Malay Peninsula is, therefore, practically confined to the State of Pahang, and an inspection of the mines there forced me to the conclusion that the future of the industry is a doubtful one.

Ancient workings:

When gold mining started there, some twelve years ago, prospectors were no doubt impressed with the size and extent of the ancient workings along many of the lines of reef. In one place I saw where a cutting had been put right through a hill several hundred feet long, and over a hundred feet high, and there is no doubt that a good deal of gold, gained from these workings but all at, or close to, the surface, has been taken out of the country.

probable age of these.

These workings are not 'ancient' as are those in Rhodesia or India; they are probably not 100 years old yet, and I fancy their origin, like most other hard work in this part of the world, may be traced to the Chinese. But in any case their presence served to attract prospectors into the country.

Early flotations.

The first mines floated in Pahang were Silensing, Punjom, and Raub. These were large concessions, embracing numerous old workings, and to the continued exploitation of these old workings in depth, all subsequent work has been confined.

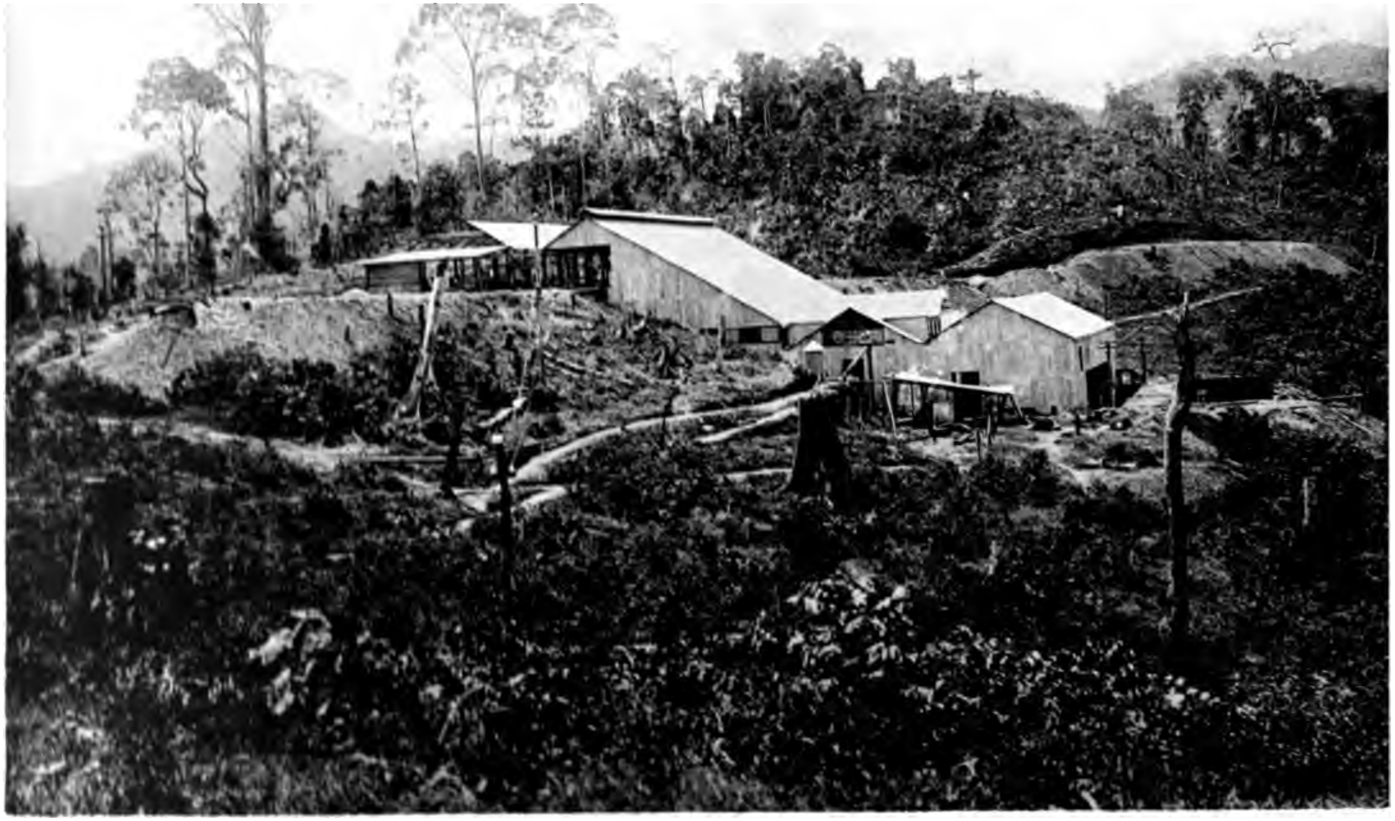
The results have not been good. In each mine patches of payable ore were found near the surface, but in depth these invariably gave out.

Silensing.

Silensing, after making good returns for some years, is now shut down altogether.

Punjom.

Punjom is still being worked, but at the time of my inspection there was no payable ore in sight. This is a Hong Kong



BATTERY AT RAUB MINE, MALAY PENINSULA.

company, and the shareholders continue pluckily to advance money in the hope of making another good discovery.

Raub.

Raub.—This has been, and is, the most important mine in Pahang. Although the shares are mostly held in Singapore and Hong Kong, it was originally floated in Queensland, and an Australian manager and staff have always been in charge of the mine.

Australian management.

I have shown elsewhere, clearly, that Australian mine managers, for some recondite reason of their own, never assay their ore, or calculate the tonnage and value in sight, but run their mines purely on guesswork from beginning to end—frequently with deplorable results.

Reported great value of mine.

This is exactly what has happened at Raub. After running for a number of years with indifferent results, one of the ancient workings, known as Bukit Koman mine, was developed in depth and proved to contain a big reef extending for a long distance. No assays were taken of this big block of ore, but on the strength of the value of that being treated at the time, which happened to be the best of it, it was reported to directors and shareholders some years ago (1) that there were 300,000 tons of rich ore in sight; (2) that the lowest workings showed no falling off in value.

Erection of electric plant.

With such a presumably great future ahead, it was decided to greatly increase the milling power, which then consisted of twenty stamps. Seven miles from the mine, in the heart of the jungle, and driven by water power, a magnificent electric generating plant was laid down, capable of delivering at Raub 400 h.p.; a new mill of forty stamps, driven by part of this power, was erected; sixty additional stamps were ordered; and in anticipation of a great output the market capitalisation of the mine rose to £1,200,000.

Sampled after eleven years.

And then, *eleven years after its flotation*, the various workings of the Raub Company were for the first time sampled and assayed.

As a result, it was found that the gold, instead of continuing rich in the bottom level of Bukit Koman, at 240 feet deep, had nearly died out; that the reef itself at that depth was poorly

Found to be greatly over-valued.

defined and broken up; and that the 300,000 tons of rich ore turned out to be barely one-tenth of the amount—and that of only moderate value. The sampling of the several other adjacent mines owned by the company showed here and there small patches of payable ore, but revealed the sinister facts that the reefs everywhere became poorly defined as they went deeper, and invariably lost their gold at about 200 feet.

The future.

The future before the Raub Company now is, I am afraid, an indifferent one. It may continue to work for years, but I see little hope of good profits being earned.

Subsidiary Companies.

Three subsidiary syndicates are developing reefs on the Raub concession, but there is good reason to think that these reefs will lose their value at, or about, 200 feet, and any success these subsidiary companies have will be by working ore found at, or comparatively near, the surface.

South Raub.

The same remarks apply to an adjoining mine, the **South Raub,** which like most of the other mines in Pahang, has its office and shareholders in Singapore.

About forty miles north of Raub, but still in Pahang, several new mines are being opened up, but only on a small scale. These are the Kechau, North Kechau, and the Tui River belonging to the Malaysian Company, which latter I had not time to inspect.

Kechau.

Of these the **Kechau** impressed me more favourably than anything else in this country of disappointments. The reef at Kechau, though only two or three feet wide, is the only well defined reef I saw in Pahang, and appears to be holding alright in the lowest workings. There are 15,000 tons of ore opened up, with an assay value of about 37s. a ton—a figure which would allow of a reasonable profit.

North Kechau.

Adjoining this is the **North Kechau;** but here the reef is only as yet exposed in one winze.

[illegible]

In thus briefly describing the gold mines in the Malay Peninsula, I have shown one salient feature of the position, which is that results have been very disappointing, and that the immediate outlook is poor; but there is another equally important point which must be dealt with.

Mining shares in the East considered as gambling counters.

Life in this part of the world—by which I mean the Straits, the Malay Peninsula, and the East generally—seems to breed in every European the spirit of the true gambler, and a gold-mining share appeals to his imagination in a way that is irresistible. The Stock Exchanges of Singapore and Hong Kong seized eagerly upon the shares of all the mines alluded to as they came out, and without rhyme or reason have put them all, at one time or another, to ridiculously high prices. Even now, after repeated disappointments, share values stand far above intrinsic merits, and the slightest sign of improvement in any mine is used as a pretext for a thorough gamble in that particular stock.

Great damage thereby done to industry.

This irresistible tendency to gamble wildly in mining shares, quite irrespective of their true values, has had the usual effect of making the mines entirely subservient to the market, with, of course, disastrous effects to sound mining or finance. Take the case of the Raub Mine. Here is a reputedly first-class mine, allowed to run for eleven years without its true value being ascertained. There was no assay plan of the mine—not even an ordinary plan—and yet in the excitement of the big gamble that was going on, everyone allowed himself to be put off with the vague assurance that it was going to be alright—'a really big thing.'

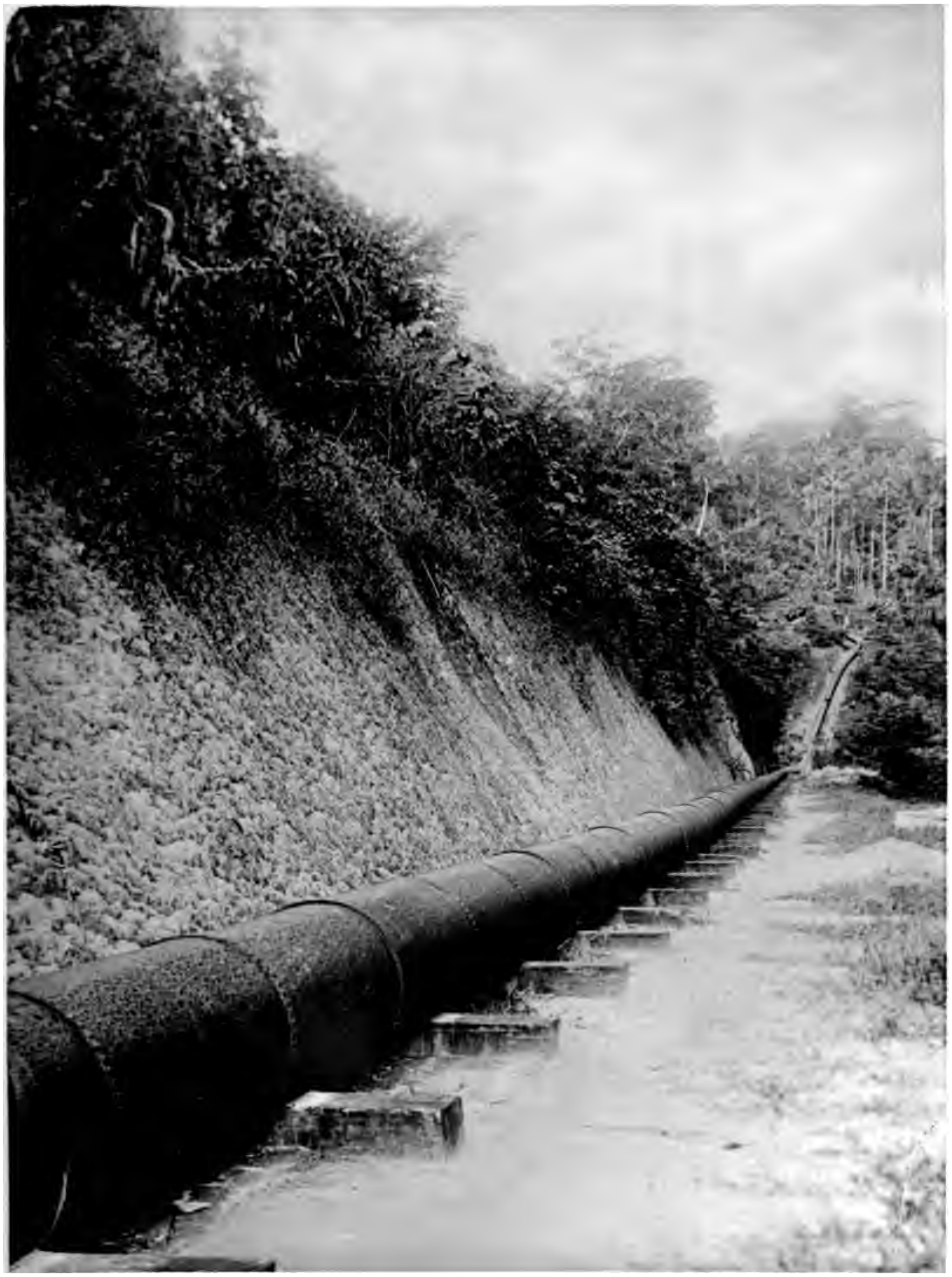
Effects of market gambling.

The slovenly handling of this mine, and the eventual collapse, was only a repetition of the booms over Silensing and Punjom. It is the same all through. The market must be considered first—the mine can take its chance. When I went through the South Raub I could not see a penny of profit in sight, but the shares were standing at $155 each in Singapore. The Kechau mine, as I said before, has some hopes of moderate su but this
depends entirely on whether the manager w ew
thousands to be spent on initial mine deve
that the company had no such sum to sp
learned the fact that a dividend of £2,0
paid away. This was earned by picking

ore only. Its payment, in the early days of the mine's history, with development yet to do and machinery to buy, leaving the company in a state of straitened finance, was quite unwarrantable, and one is led to the conclusion that here again the state of the market weighed more with the directors than the state of the mine. Another example: At North Kechau there is no ore developed, but already the company has spent all its cash in erecting ten stamps. When the time comes to start crushing there will be no ore to crush, and no money to develop it; the expedient which is to be tried, of crushing worthless surface boulders, will probably land the company in bankruptcy.

Conclusions. And now in conclusion. What wonder is it, after having inspected the mines in Pahang, that I can only state their position to be bad, and the gold-mining industry there, carried on as it now is, more or less of a farce. On the one hand, the reefs, often rich
Unfavourable. near the surface, lose their gold in depth. On the other hand, the real interests of the mine—its finance and its sound working—are made subservient to a lot of gamblers on the share market. In the long run nobody benefits by this. Slovenly mine managers flourish; directors wretchedly weak in finance, with one eye on the market quotation, control the mines' policy; shareholders, their critical faculties gone, even as the gamblers' go, lose their money. Everbody suffers deterioration to some extent.

We British may have a great many things to brag about, but our handling of the gold-mining industry, whether in Pahang or in many other places that I have visited, is certainly not one of them.



PIPE LINE GENERATING ELECTRIC POWER AT RAUB MINE.

CHAPTER IX.

THE GOLD MINES OF CANADA.

Canada: its gold-mining districts; yield in 1900;

THE yield of gold in the Dominion of Canada for 1900 was the largest on record, being estimated at $27,916,752. There are goldfields in Nova Scotia, Ontario, British Columbia and the Yukon Territory; these districts yielded in that year the following sums:—

	REEF GOLD.	ALLUVIAL GOLD.
Yukon (Klondyke) -		$22,309,205
British Columbia -	$3,453,381	1,278,724
Nova Scotia - -	577,581	
Ontario - - -	297,861	

This yield, if it were continued, would place Canada fourth on the list of gold-producing countries—that is to say, next after the Transvaal, Australasia, and the United States. But such a yield cannot be kept up, and it may be a good many years, in the natural progress of mining enterprise, before this figure is again reached.

this yield cannot be kept up.

The Klondyke yield.

The reason for this is, of course, the exhaustion of the richest claims at Klondyke. That alluvial field is by no means worked out, but the yield from it will never again be what it was in 1900.

When I was in the Yukon, in the fall of 1901, the estimated output for that year was placed at sixteen million dollars a big drop from the twenty-two millions in 1900; my opinion is that the yield will continue to fall. As yet there are no genuine discoveries of payable quartz in the Yukon, but these may come in time.

British Columbia yield.

British Columbia must be looked to as the backbone of lode mining in the gold-mining industry of Canada. But the gold mines there have been disappointing. Prospecting and development work has not opened up the new mines which the appearance of the country in 1898 justified one in expecting. This country, too, is badly handicapped in England because of the many worthless mines, of all sorts, which have been floated there.

Nova Scotia yield.

Nova Scotia produces about 30,000 ozs. of gold a year. The output shows a small increase. The gold-mining industry there, mostly run by local capital, is an old one, and, on the whole, seems to have yielded good profits. The reefs are found in anticlinal formations, similar to the saddle reefs at Bendigo in Australia, but have never been followed to the great depths to which the Bendigo reefs go down. To work these Nova Scotia reefs, which are found in several different places, about 370 stamps have been erected; these are mostly in small mills of 20 or 30. The average return per ton of ore is about $9.

No. of stamps at work, and yield per ton.

Ontario yield—a failure.

Ontario as a gold producer is so far a failure. Quite a number of places are known in this great territory where gold is found, and no end of official literature on the subject is turned out; but as for mines showing any signs of permanence—they simply do not exist; and the shares of those already floated are nearly all worthless.

Lake of the Woods.

Some years ago the Lake of the Woods was much talked of as a coming mining district, and the three most prominent mines there—the Regina, Mikado, and Sultana—were floated in London. Their several histories since flotation are as follow:

Regina.

The **Regina** was floated in 1896; worked at a loss; passed into the hands of the debenture holders; and is now reconstructed under the name of the **Black Eagle.** It is being re-equipped. Its future is doubtful.

Mikado.

The **Mikado** was floated in 1896, and paid a 5% dividend in 1900; its future is doubtful.

Photos by T. A. R. Purchas, Esq.

LAKE OF THE WOODS DISTRICT—ONTARIO.

The **Sultana,** floated in 1899, not only had a capital of £239,707, but made itself responsible for a mortgage of £10,000, on behalf of the vendor, who deposited 50,000 shares as security. Since then the mine has been worked at a loss, and the reef has been cut off by a fault. It is evident, on the head of this, that unless the mortgage is paid off the company will soon be in a poor position, for the security against the mortgage can have but small value. This flotation was underwritten privately, but a Stock Exchange quotation was afterwards allowed. I cannot understand why.

Sultana – the mine is mortgaged.

Elsewhere in Ontario are several small gold-producing mines. Only three of these seem to give yields. These are the Foley mine, with 20 stamps, belonging to the **Canadian Mines Development Company;** the Deloro mine, belonging to the **Canadian Goldfields;** and the Belmont mine of the **Cordova Exploration Company.** The two last-named mines are large producers of arsenic; gold being a less important product.

Other small mines in Ontario.

This summary of gold-producing districts in Canada ends with the North-West Territories. Several dredges there are being started to work the sands of the Saskatchewan River. As yet I know of no results from these.

North-West Territories.

One day, in the summer of 1896, when people in Johannesburg were still talking about the Raid, and when the rich crushings of the Great Boulder were just beginning to attract attention to Kalgoorlie —one day in that summer, four persons were wandering up the bed of a creek in the far North-West of Canada, searching for gold. The party consisted of a white man —half trapper, half prospector—who had lived in those regions many years, his Indian wife, and two Indian brothers-in-law. Every now and then, as they went up the creek, they would stop and take a prospect, and the Indian woman would pan it off. So far the net result had been plenty of 'colours,' but never enough to tempt them to stop. At last there came a panning which, as the lady, with a deft turn of the wrist, allowed the water to carry the last of the gravel away,

Discovery of Klondyke.

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revealed, lying in the bottom of the pan, several dollars worth of gold. Then did the white man rapidly remove his coat, give orders to the Indians for the sinking of some more holes through the gravel to the bed rock, and himself panned off the prospects as they came up. The result was more pans of dollars, even ounces of gold, and in this manner was Klondyke discovered to the world. The white man pegged off his claim on the spot—Discovery claim on Bonanza Creek—and the two Indians pegged claims immediately adjoining, which they hold to this day. The discoverers journeyed in their canoe down the Yukon river to Forty Mile, a small mining camp, where they registered their claims; and a rush of all the men scattered over this far North-West, perhaps two hundred altogether, then took place to the spot. Their finds during that autumn and winter soon made it evident that this was the richest alluvial diggings discovered since the early days of California and Australia, and in the following spring thousands arrived at Klondyke from all over the world.

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pectors in
Yukon.

The discovery of payable gold in the creek beds of the Klondyke District just about that time—as one can see now—was bound to happen; as a matter of fact, at the moment of the rich discovery, several other prospectors were at work within the district. Since the year 1884 small parties of men had every season gone up from Juneau on the Alaska coast, and had always panned out enough gold to make a fair living. The area they prospected was a vast one—partly in Canada, partly in Alaska—and the boundary line of the two countries, along the 141st Meridian, was, no doubt, crossed and recrossed many times by each prospector. For the first few years there were rarely more than a dozen or twenty men at this work; but as they continued to return to Juneau with good bags of gold, others followed them, and by 1894, after ten years of it, there were nearly two hundred men. In those days their rallying point was at Forty Mile, a small settlement on the Yukon about sixty miles below Klondyke, close to the Alaska boundary, and it was from that place that the news of the rich discoveries was circulated.

The Klondyke District, from the day of that first rich panning by the Indian woman, has yielded from its creek beds no less a sum than £13,000,000. Yield of gold to date.

About 1,300 miles up the Yukon river, in a country that is formed of alternate ranges of hills and watersheds, and which is generally covered, except on the hill tops, with forests of stunted spruce, birch and poplar, there are two tributaries, the Klondyke and Indian rivers, which fall into the Yukon about twenty miles apart. Between these small rivers the country rises to a high ridge, with an elevation of 2,500 feet above the Yukon, and from each side of this ridge flow a number of creeks towards one or other of the rivers. Flowing into the Klondyke, either direct, or after junctioning with other small creeks, are Bonanza, where the first discovery took place, Eldorado, Bear, Hunker, Last Chance and Gold Bottom Creeks. On the other side of the divide, flowing into the Indian river, are Dominion, Gold Run, Sulphur and Quartz Creeks. The whole of these lie in an area about twenty miles wide and forty miles long, which is bounded on three sides by the Yukon, Indian, and Klondyke rivers, and known to its inhabitants as 'the Klondyke.' The geology of this gold-field is peculiar. Over nearly the whole of the area the rock is a coarse, very silicious schist, greyish green in colour, which often shows as being talcose or chloritic. Its strata lie irregularly, often flat or twisted, and in places eruptive masses of diorite and diabase break through. Everywhere the quartzose nature of the schist is marked, and veins of solid quartz run through the whole mass. The creek beds, which vary in width from perhaps 1,000 feet at their lower ends to fifty feet, or less, near their source, carry a layer of gravel from a foot or two to twenty feet thick, which in turn is covered with a layer of black bog clay.

The district described.

The gold-carrying creeks.

Geology of Klondyke.

The areas of gold-bearing gravels.

But large as is the quantity of gravel lying in the creek beds, an equally large amount is found on benches on the hill slopes, lying at as much as 300-400 feet above the levels of the creeks. These 'bench' or 'hill' gravels, like those in the creek, contain quartz boulders of all sizes, and are often just as rich in gold. The gold everywhere is mostly contained in the lower foot or two of

Origin of the gravel beds,

and of the gold.

gravel—usually, indeed, it has sunk into the schist itself, which is decomposed for several feet in depth—and the rest of the gravel, which on the hill benches is sometimes found hundreds of feet thick, is almost worthless. As to how these layers of gravel came to lie at different horizons, whether they originally formed one bed, of which the central portion has sunk into the creek, or whether they were formed at different times, by different agencies, I leave to the realms of empiric geology. The important question is not 'how did the gravel get there' but 'how are the big deposits of lower grade gravel to be worked at a profit under existing conditions'?

Another question that cannot be answered is 'how did the gold get there'? The gravels have the appearance of being water-worn to a greater extent than the gold, and probably have been brought there from afar. The gold, I should say, had travelled a short distance, or not at all. Possibly the gold now concentrated in these gravel beds originally existed in numerous small veins of quartz lying almost directly above where it now is; but in a great period of time all the rock containing these veins eroded, leaving only the heavy bits of gold to sink lower and lower, and to concentrate into certain well-defined channels where we now find them.

'Pay streaks' in the gravel.

The rich gravel nearly worked out. Can the low grade gravel be worked at a profit?

Another point is that the gold is not evenly distributed in the gravel beds. There is always, either in the creek gravels, or on the hill deposits, a 'pay streak' which carries more gold than the rest. Sometimes this streak is 50 feet wide only, or it may be 300 feet—bringing a fortune to the owner. It is capricious in the extreme, and no one can put a value on any given claim unless the extent of the pay streak in that claim has been fairly well outlined. *Much of this rich ground, where the pay streak is widest, has already been worked out.* The future real problem for the Klondyke is how to work at a profit the big areas of gravel, where there is no richer ground, and which are really low grade in value.

I can offer no explanation of how the Klondyke gravel beds were placed there; whether the creek gravels and the hill gravels have the same origin; where the gold itself came from; or why it should be found in rich and poor streaks? A dozen geologists have built up a dozen theories about it—but they can only guess at these questions. The owner of a low grade claim at Klondyke is looking out to-day not for a man who will tell him how the gold and gravel got there, but for the man of action and economy who will set to and separate the one from the other at a profit.

Will payable reefs be found at Klondyke?

There is still one more geological question. Is payable quartz going to be found at Klondyke? My answer is—from noting the irregularity in dip of the schists, and from the inspection of several so-called quartz and copper lodes now being opened up—emphatically no. There are quartz stringers in abundance, but all are barren, and will not hold in depth; and there are dykes of diabase in which gold bearing pyrites occur; but as yet nothing even remotely looking like a permanent body of payable stone has been found. A rumour of a wonderful discovery of banket in the district was once put forth, and reached me even in Australia. When at Klondyke I should have wasted some days in going to see this, but fortunately a friend of mine there, an old Johannesburg man, had already inspected the place. He pronounced it a conglomerate, but its average value, from a number of samples taken, showed only traces of gold. Let it be sufficient for Klondyke, in the meantime, that it is the most important alluvial field now being worked; that its success for several years more is a matter of certainty; and that on the proper handling of certain problems, which we will consider in due course, hangs an equal success at a more remote future.

This is not probable!

The journey to Klondyke.

The journey to Klondyke may be said to commence at Vancouver. From there to Dawson City is 1,426 miles, and in the summer season this takes about a week to do. From Vancouver to Skagway, 867 miles, skirting the coast of British Columbia and Southern Alaska, is the finest bit of sea in the world. It is really an inland sea, formed by a continuous chain of islands lying parallel with the coast and often not more

The Alaska sea coast.

than half-a-mile from it. On each side is glorious scenery—forests, mountains tipped with snow, glaciers many miles in extent, pass in succession; the rivers swarm with fish, and salmon canneries dot the coast; whales and other strange monsters sport in the dead, calm water; an occasional iceberg floats by; Indians can be seen in their canoes, or at work in their small villages. Over all is a clear sky and a warm summer air, which lasts until October. At Skagway, in Alaska, you get on the train of the White Pass and Yukon Railway, and cross the mountain chain; 111 miles further on, you change into a comfortable river steamer, and after a two days' run down the Yukon, of 448 miles, you are actually in Dawson. From London to Dawson, in the summer season, is now only a journey of about 21 days.

FROM LIVERPOOL TO KLONDYKE.

Time and cost of the journey.

	Miles.	Days.	Cost. $.	
Liverpool to Montreal ...	3,050	9	75	1st class, including all expenses on route. 150 lbs. baggage allowed free.
Montreal to Vancouver (C. P. R.)	2,906	5	120	
Vancouver to Skagway (boat)	867	4	30	
Skagway to White Horse (W. P. & Y. R.) ...	111	1	20	
White Horse to Dawson (river steamer) ...	448	2	55	
	7,382	21	300	

The White Pass and Yukon Railway Co.

It must be noted that to get from Skagway to Dawson, a distance of 559 miles, the cost is $75. This goes into the coffers of the White Pass and Yukon Railway Company, which in its own name runs the railway over the mountains, and, under the title of the British Yukon Navigation Company, owns the best river steamers. If you are also shipping goods into Klondyke, the freight the company will charge you (at the time of writing) will work out at well over £20 a ton.

its freight charges:

These charges are much too high. The White Pass Company expected last year—1901—to make a clear profit of over £300,000. I am sure that the aggregate profits of the Klondyke claim owners for the same period were not more than this, so that the Railway Company's drain on the territory can be gauged.

its policy will prove harmful to the development of the Yukon.

The policy of the White Pass Company is easy to understand. With great pluck and enterprise it builds—in an outlandish region—a railway which is one of the engineering feats of the world. This line costs six or seven hundred thousand pounds, and the only guarantee for its financial success is an alluvial field that in a year or two might be worked out as so many others have been before it. With profits from the first year's work they continued the line to its present terminus at White Horse, and then secured the position by buying the principal fleet of steamers on the river. So far the undertaking was a sound one; and if the shareholders wished to charge prices which would give them their capital back in five or six years, fair critics can find no fault.

Watered capital of the company.

But the capital of the company has been watered with no sparing hand. Of the issued capital of £1,700,000, I suppose more than half is 'water'; as a consequence, the real work of the company has had to be done on a 5% debenture interest of £750,000.

This means that, to earn a big dividend on its watered capital, the White Pass Company last year levied passenger and freight charges aggregating about one-fifth of the production of the whole Klondyke district.

Competition *with* the lower river route:

High rates always bring in competition, and this year a strong effort will be made to divert the greater part of the freight to the lower river. The lower river route is by ocean-going steamers to St. Michael's, and transhipment there into shallow draught steamers, which run up the river 1,300 miles to Dawson City. This route is open for about three months in the year. An inclusive charge of $50 a ton on freight, from the cities of the Pacific coast to Klondyke, by the all-water route, would pay well, and it would result in the White Pass Company—if it wished to retain the bulk of the traffic—reducing its present rates by probably one-half. This, again, would lead to a cheapening of production along the Klondyke creeks, the tackling of lower-grade gravels than cannot now be worked, and a return of confidence in a number of the outside districts in the Yukon.

its probable result.

The journey down river from White Horse is for the first half on the Lewes, and then, after junctioning, on the Yukon. At the point the Klondyke river enters it, the Yukon is about a quarter-of-a-mile wide. Here lies Dawson City—with over 5,000 inhabitants, many substantial wooden buildings, and a congested central area in which well-filled shops, restaurants, hotels, theatres, and dancing-halls are crowded together. Overhead a warm sun shines; people are wearing light summer clothes; the shops are full of edible berries gathered on the hills, vegetables grown in the market gardens, and salmon caught in the rivers. This is Klondyke in summer.

Dawson City described—

Prices of commodities, however, are liable to shock one. An excellent meal costs no more than a dollar, and good, strong clothes for mining in, shirts, boots, and such-like, are not outrageously high. But to hire a horse costs £2 a day; its food for a day costs 10s.; a bedroom to one's self, 12s.; a single copy of one of the several newspapers, 1s.

the town is overdone and is likely to decline.

Outwardly there is an air of unusual prosperity; gold dust and nuggets are a common form of tender, and one soon gets used to the sight of quantities of raw gold. But get behind the scenes and you see that there is not so much prosperity after all: that the town is overdone in every respect—like so many other mining towns—and that a reaction is certain to come before long. Many of the small traders must fall out and give way to the several strong commercial companies which are gaining every day a greater hold over the place. Even on the creeks the individual miners, with their gutted-out claims, must combine for the cheap working of these, or sell out to a few strong holders. In any case Dawson must decline.

Many claims are mortgaged at high rates of interest :

the result of this.

The banks have much town property in Dawson mortgaged to them, and many of the claims are also mortgaged up to the hilt. The rate of interest is terrible—always two, and often as high as four and five per cent. a *month!* Who can stand this? I know that a great deal of the ground at Klondyke is mortgaged; that many claims have had to be gutted out and half ruined in order that the owners may take out enough gold to pay the interest only, and that the actual mining profits from the district—in spite of the richness of the gravel—are not nearly as large as people think. That is one reason why it is unwise of the White Pass Company to draw four million dollars a year from the Yukon. The development of this big country rests with the prospector and the miner. If these men do not make more at Klondyke they will leave the country in disgust, and a dozen other fields of value in the Yukon may remain undeveloped for years to come.

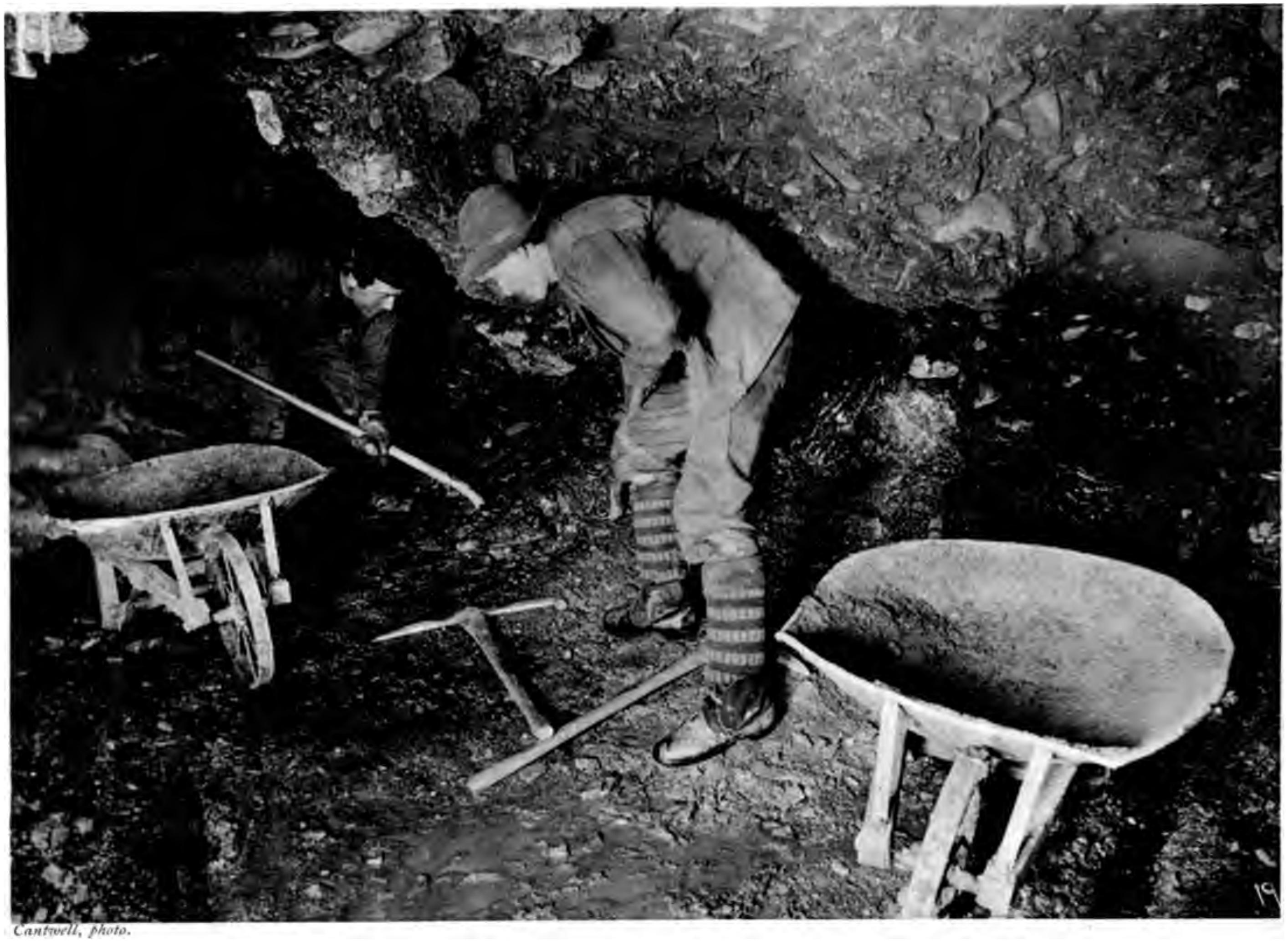
The population.

Work done by Swedes and Finns.

The population of the Klondyke—pending a census—is supposed to be about 15,000. Americans account for, perhaps, three-fifths, and a third may be Canadians. There are at least several thousand Finns and Swedes—all of whom are miners or labourers. Many of these are naturalised Americans, and quite a number own and manage their own claims. One Swede, whose claim I visited, had, off his own bat, and with the assistance of a bank, spent several hundred thousand dollars in buying a block of rich hill claims, and had started—by pumping up water from the creek at an appalling cost for fuel—the first hydraulic sluicing-plant in the Klondyke. The ground was undoubtedly rich, and I suppose by this time that he—one of the few—has made a fortune for himself. There were other Swedes, too, doing well, and their work, physical and mental, on this Canadian goldfield, must be rated at least as highly as the work of the same number of Canadians or Americans.

Wages

A labourer at Klondyke receives $5 a day and his food—or an allowance of $3 for food; also accommodation in a log



Cantwell, photo.

UNDERGROUND GRAVEL MINING—KLONDYKE.

cabin; this is the minimum wage at Klondyke, and I do not see how it can be reduced. To enter the country from the Western States or Canada, costs $100, and to leave it another $100; the season lasts for only five months, and if he is not fortunate enough to get work in the winter on one of the claims where winter work is done, or at cutting down trees for fuel, he will certainly exhaust his savings in keeping himself alive and fit until summer again comes round.

The yield of gold.

The record of gold production from Klondyke is as follows:—

1897 … … … …	$ 2,500,000
1898 … … … …	10,000,000
1899 … … … …	16,000,000
1900 … … … …	22,500,000
1901 (say) … … …	16,000,000
	$67,000,000

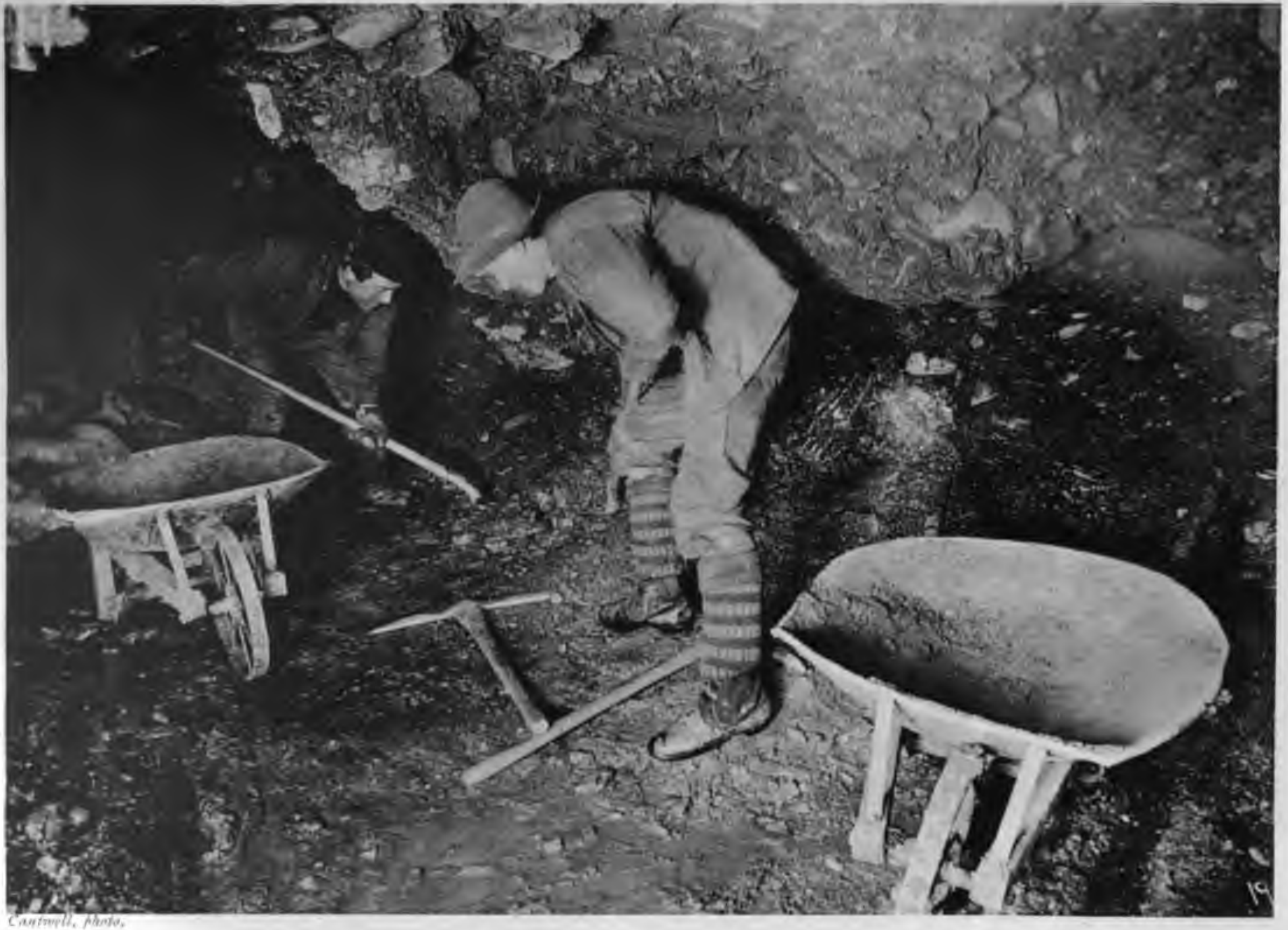
The gold is worth about 64s. an ounce.

In the future the yield will fall off.

The falling-off in 1901 shows clearly that the zenith was reached in 1900. Up to that time only the richest ground was worked. But already many of the best claims are finished, or will be this year, and the yield will continue to fall. These rich claims were, and are, wonderful; but they cover a limited area, a small fraction of the total gravel-bearing area of the district, and in two years from now will be things of the past. The future lies, as does the future of every gold-mining field, in the treatment of great quantities of low-grade material. At Klondyke the bulk of gravel area is of low-grade, as compared to the ground already worked out. I shall try to show the conditions under which this low-grade ground will have to be worked.

Future problems for working the lower-grade gravel.

I am, I will assume, the holder of a creek claim. It is 500 feet long; 300 feet broad from bank to bank; and carries gravel 12 feet deep, lying under the usual layer of black mud. Prospect holes have been sunk in various places, showing the ground to be of moderate value. The contents of the claim



Cantwell, photo.

UNDERGROUND GRAVEL MINING—KLONDYKE.

with fuel bunkers, and a dam to retain the tailings. A steam shovel could probably be used to break down the gravel, and the whole face of the gravel would be taken as it came. Such a plant, laid out to advantage from the start, and the outlay borne over a group of claims instead of a single claim as at present—would reduce costs considerably. To this must be added strict integrity in management—a thing somewhat rare at Klondyke, so far—and a system of economy in small details, as close as that in a Scotch colliery.

Possible economies.

As to any marked reduction of costs outside of this, I am doubtful. Wages is by far the most important item, and, for reasons already given, the labourer is not likely to get less than $5 a day for years to come. If the White Pass Company lowers its rates, the labourer could be fed for less, and mining stores would be cheaper. Fuel for the pumps would only get cheaper if wages were lowered. Coal, or rather lignite, has been found within 60 miles, but it is not yet a commercial possibility.

But always looming ahead is the seven months' winter. The whole year's work, and its profits, must be compressed into about 130 days. This is a drawback that can never be remedied. The days of winter work—which consisted of sinking shafts into the frozen gravel, and, after thawing, extracting the lowest few inches of it, and a foot of the decomposed bedrock—are nearly over. Only the richest ground could stand the expense of this style of work.

Dredging.

Dredging has been suggested as a method of working the creeks. I saw at work one dredger which at great cost had actually been erected. But dredging will not do. The ground in many places is frozen tight, offering a distinct resistance to the buckets, and where the bed-rock is not decomposed, the large percentage of gold lying in the creeks cannot be reached.

y of

Of course the vital drawback at Klondyke is the scarcity of water. To work the low-grade creek gravel, and all the hill gravel, hydraulic sluicing is the only possible method that will yield a profit. But the supply of water is inadequate, and as for water under natural pressure there is said to be no such possibility at Klondyke. With a big head of water under natural pressure, the low-grade gravels at Klondyke could be worked profitably to produce many millions of dollars. Here and there pumping plants in the creeks are throwing a small head of water up to the benches and hill claims; this is for ordinary sluicing purposes only, but the cost is so heavy that only the richest spots on the hills can be thus supplied. A scheme for pumping up water from the Klondyke river, carrying it along the ridges—on one or both sides of the creeks—and delivering it to the various hill and creek claims, under pressure, might well be taken into consideration by the Canadian Government. It is a scheme far less costly than the water scheme of the West Australian Government—to supply Coolgardie and Kalgoorlie—and has in it more of the elements of a profitable undertaking. But the Government considers such a scheme outside its natural functions, and has already given a *concession* to certain private persons to erect a pumping plant and supply water to the claims on Bonanza and Eldorado Creeks. The word 'concession,' as between a government and a mining-field, is connotative in these days. The government of the Yukon Territory, in which lies the Klondyke district, is controlled by the Canadian Minister of the Interior at Ottawa. He, in his turn, has had to rely on advisers who knew nothing of conditions there, and, as a consequence, the handling of the mining industry—the backbone of the country—has been weak and inefficient. There are, firstly, far too many officials, and from the Gold Commissioner downwards, nearly all are ignorant of mining matters. The local mining laws are weak; the miners are for ever quarrelling over boundaries and water rights, and the only remedy appears to be a lawsuit, or series of suits, in the local Courts. The Gold Commissioner, his assistants, and the Claim Inspectors, seem to have no power—or to be afraid to use it. Their only remedy is 'Oh! take it into Court.' Dawson, as a consequence, reeks with lawyers and litigation. A couple of Australian mining wardens, of the old school, who would ride up the creeks themselves, interrogate the parties to

A suggested Government pumping scheme.

Government of Klondyke:

too many officials:

too much litigation.

a disp ld settle the matter on the spot—sticking the boundary and wat ght pegs into the ground themselves, and warning the n touch these at their peril—would do more good than the of officials there now, and would soon empty the Court itigants.

cessions—

An r bad thing is the regular system of concessions which has sprung up. Do the Canadians who flock forward to fight the c ncession mongers in the Transvaal, realise that their own M giv aw ssions at Klondyke that are contrary he best interests t field?

I k of the f ncessions while at Klondyke, but others:—

uncut ber:

(1.) A concession of a big ar a of standing timber, for a distance of some miles along the K ondyke river—in the heart of the district. The owners of this estimate the quantity at near two million cords, and ask a price of $5 a cord uncut.

for unpegged ground:

(2.) A concession of all the unpegged ground on the hills above Bonanza Creek. This embraces various fractional pieces of ground which intersect blocks of working claims, and gives the owners of the concession a hold over the owners of these claims that they should not have.

(3.) Concessions for big areas of gravel on Hunker and Quartz Creeks.

for a tramway:

(4.) A concession for a rail or tramway from Dawson to the junction of Bonanza and Eldorado Creeks.

for pumping water from the Klondyke river.

(5.) A concession—already alluded to, and the most important of all—to supply water along Bonanza and Eldorado Creeks—at a price of $40 an hour per sluice head. This is a quite prohibitive price, and one which is 2½ times greater than is now being charged by a local company for a water supply. This concession also, by its terms, closes the Klondyke river to any opposition pumping plant.

These should be cancelled.

Now, even if these concessions are given with the best intentions in the world, they are a prerogative of Government that should not be tolerated. They are sure to lead to abuses.

As a matter of fact I know the terms of several of them are not being observed by the concessionaries. If the system is allowed to crystallize, in time people will compare the government of the Yukon with that of the Transvaal under the Hollanders.

English-floated properties at Klondyke—nearly all are failures:

reasons for this.

While at Klondyke, I inspected the properties of the dozen or so English-floated companies. These have nearly all been failures. Firstly, they paid more for the ground than will ever be taken out of it; secondly, the local conditions were entirely against them. The excessive cost of labour, supplies and fuel, the too heavy tax on gold produced, the dishonesty (in some cases) of the men in authority, and the thefts of gold by the workmen, the capriciousness of the gold contents, the scarcity of water, the incessant litigation, the long winter season, with its costly and haphazard style of work, all these causes, and many more which the underwriters and directors never could have imagined, simply paralysed them. I found the properties either shut down, or working with little success. All are discredited.

Alluvial claims of this sort should never be floated into public companies.

As a matter of fact, alluvial claims such as these should never be floated into a company. Only the very richest claims at Klondyke would have stood any watered capital; all the rest can barely return, with a fair mining rate of interest, the actual money laid out in their purchase, and in the erection of a little machinery. They might have returned their capital if valued at £10,000, or even £20,000, but as these dozen companies have capitals ranging from £45,000 to £430,000—with sometimes the sole asset of a single claim—their collapse has been a matter of course.

Klondyke Consols. (Issued capital, £250,000.

The **Klondyke Consols** is the best of the English mines. The company owns claims 14-15 on Eldorado Creek. These are two of the richest claims at Klondyke; they have yielded returns from which several dividends have been paid; and they will not be worked out for two or three years. But with all their richness, these claims will never return in profits the capital of the company, let alone any interest on it. I suppose that from now, onwards, these claims will yield a profit of not more than 10s. a share. There are other claims owned by the company in different parts of the field, but their value is doubtful, and a profit from the working of them cannot be relied on. I cannot under any circumstances see that the shares are worth par.

Klondyke Bonanza.

The **Klondyke Bonanza** owned a moderately good claim (No. 5 below discovery on Hunker Creek), but this is now practically worked out. On any other field this claim would have yielded a big profit, but I believe the funds in hand now, when it is worked out, are insignificant. The claim seems to have been well handled in the working; the small balance of profit, over and above expenses, serves to show the hopelessness of making a company here pay.

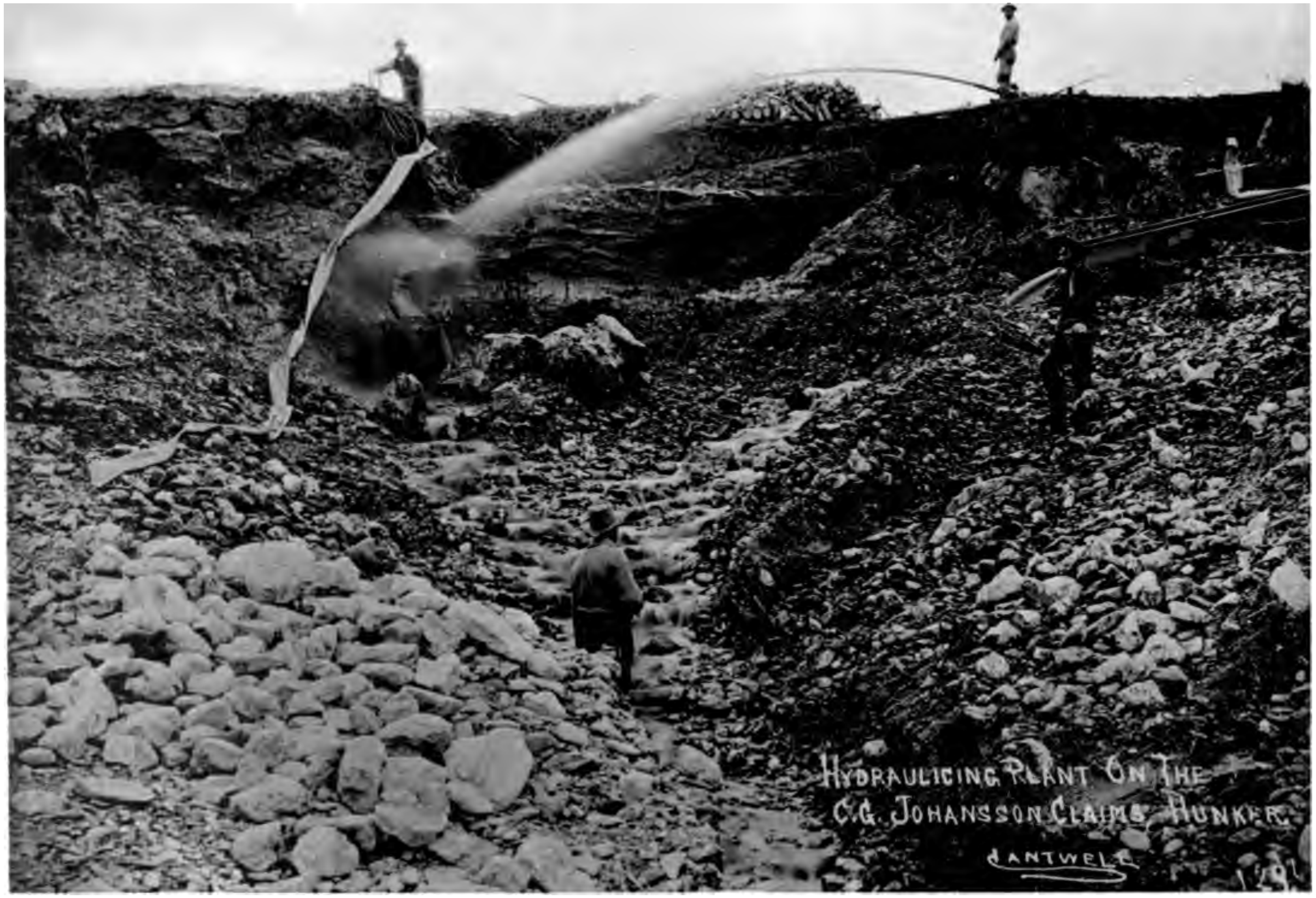
Another claim (No. 14 above on Hunker) is owned by the company, but this is poor, and will probably not pay to work under present conditions.

Yukon Goldfields.

The **Yukon Goldfields** owned two claims: one in Bonanza Creek, and one rich one on Cheechaco Hill. These are now worked out. Here is another company ready to wind up—unless it can find a payable claim somewhere else—and even the working of an exceptionally rich claim has yielded it no profit to speak of. The earlier management of this mine killed profits, but under no circumstances could shareholders ever have got their capital back.

McDonald's Bonanza. (Issued capital, £98,465 pref.; £335,000 ordinary.)

McDonald's (Klondyke) Bonanza is another claim that is now worked out. This, too, was a very rich claim; it yielded probably $40 to the square yard, but was capitalised at $100 to the square yard, with expenses of working to be deducted into the bargain. Referring to the flotation of this company, I read the reports of several experts as to the claim's 'value.' I suppose some day these documents will be framed for museum purposes. This was the best worked claim at Klondyke last season. I noticed economy and good system, and



HYDRAULICING AT KLONDYKE WITH ARTIFICIALLY RAISED WATER.

the cost sheet showed results lower than those of any other mine there. The company now owns a worked-out claim, but has machinery on hand, and about £10,000. If, for this sum, a moderately good claim can be anywhere secured, shareholders may, I think, trust their local staff to earn a profit on the working of it.

Anglo-Klondyke. (Issued capital, £120,000 ordinary; £24,078 deferred.)

The **Anglo-Klondyke** owns over 30 hill claims, lying in two blocks. At the first blush, 30 claims seem a big property, but it must be remembered that the richer 'pay-streak' runs only through a few of the claims, the rest of the gravel is low-grade, and would only pay by hydraulic sluicing. In two years more, therefore, the present grade of rich gravel will be worked out, and the remaining claims will be of doubtful value. The gravel now being worked is good, being worth $12-15 a square yard, but of course two years' supply of it will not suffice to pay off the capital, or even half the capital. The company is badly off for water. Last season several big dumps of gravel were got ready to be sluiced, but not enough water came to fill the sluices, and a value of perhaps $30,000 had to lie in these gravel dumps till this season.

The shares of this company are over-valued at par.

Klondyke Government Concession. (Issued capital, £55,000 preference; £245,000 ordinary.)

The **Klondyke Government Concession** is a big area of gravel—two miles of it—at the lower end of Hunker Creek. I presume the Government gave a concession over this ground, thinking it too low-grade to be worked by the individual miner, and expected that the concessionaire company would work it on a big scale by machinery. But the company mishandled the ground, lost its money, and shut down the mine, thus showing the unwisdom of giving the concession. The mine is now shut down, and the funds in hand are nothing to speak of. I believe that if this big area were worked in the open-cut system it would pay, and the big size of the property might, in the long run, enable it to be worked into one of the best things at Klondyke. This property will have to be reconstructed, but it is worth watching.

Yukon Corporation.

The **Yukon Corporation** is distinguished by being the worst-worked property at Klondyke. Its best claim (No. 35 on Upper Bonanza) if worked by open-cut would have made a big profit, but it has been gouged out by winter thawing, so that much of its area is now rendered unsafe to work in this way, and its surface is crowded over with costly flumes, scaffoldings, and sluices, which seem to have achieved no purpose. Probably, even now, this claim will have to be worked by open-cut, but, of course, at small profit. The company owns four or five other claims on different creeks, which are of doubtful value.

Dome G.M.

The **Dome G. M.** is at present being reconstructed. Its assets that I know of, are Claims No. 2 below on Hunker; 22 below on Bonanza; and 38 above on Sulphur Creek. I believe these to have little value.

Klondyke Development Company. (Issued capital, £45,000.)

The **Klondyke Development Company** owns six adjoining claims on Sulphur Creek. These claims cost about £14,000, and were thought to be—as purchases went at Klondyke—a good bargain. But shafts sunk in the gravel showed the pay streak to be only about 20 feet wide, and even at that the gravel was not rich. The claims are now let on tribute. The tributors pay the company 20% of the gold won, which serves to keep it from going into debt. But I am afraid there is no future for the mine.

Quartz Creek. (Issued capital, £100,000.)

The **Quartz Creek Syndicate** owns a big area of bench gravel on Quartz Creek. This ground is a concession, the *quid pro quo* being that the company undertakes to sluice it on a big scale. Sluicing with a small head of water, pumped up, was tried for several weeks last season. Then the company found there was trouble over the water right, and I imagine it will have to spend a big sum in bringing water from the Indian river. This means [illegible], and a working capital of £50,000. The value [illegible] considered payable; but my inspection of the [illegible] think that in several matters the management [illegible]

Other alluvial fields in the Yukon.

So much for Klondyke. As to other alluvial fields in the territory, there are six or eight tributaries of the Yukon on which discoveries have been made, and for the next year or two these will be pretty closely prospected. At White Horse there are a number of copper deposits, but no gold. Given fair treatment by the White Pass Company for the next few years, moderate success from working the low-grade gravels at Klondyke, and a sufficient overflow of prospectors into these outside districts, the result is sure to be some alluvial fields worth the having, and perhaps even discoveries of quartz reef.

Future of the Klondyke field.

As to Klondyke itself, the best ground is nearly worked out, and the output is now decreasing. There is a great deal of low-grade gravel still unworked, but under existing conditions this can hardly be treated at a profit. The only course is to amalgamate claims into groups, and work them on a big scale, and with machinery, by the open-cut system.

If water can be pumped up from the Klondyke river to allow of sluicing the creek beds and portions of the 'bench' and 'hill' gravels, this will add largely to the low-grade areas that can be handled in future; but such important rights as this pumping scheme involves should not be given away as a 'concession.'

British Columbia.

British Columbia as a mining country has been much written about by mining men, and theorised over by geologists; a great number of gold mines, too, have been floated there in the last few years.

And the net result of it all, so far, is almost complete failure.

Much English capital has been lost here.

English capital up to the present has been largely used to exploit the country. But English investors are now so disgusted with the dozens of valueless mines foisted on them, that this vital source of income is almost dried up. Unless some discoveries of real value are made before long, British Columbia lose its importance in the London mining market.

The yield of gold in 1900 was 231,000 ozs. Deduct from otal the individual yields of the Le Roi, War Eagle, Ymir, and Consolidated Cariboo, and there is no yield from any other gold mine that is worth noticing. Two of these mines, Le Roi and Ymir, are English-owned; to these we may add a new producer, Le Roi No. 2, and these three mines seem at present to be the only gold-mining assets of any decided value that English capital has got hold of.

Diverse kinds of ore are worked here.

Mining is so diversified in this province, and the ores are so complex: on Vancouver Island there is excellent coal, and combined copper and gold ore; on other islands there is copper; on the mainland there is good coking coal, which is going to find a big market in the States; there are the silver lead mines of the Slocon, and the same ores are found in many other spots; the copper ores of the Boundary District; the copper and silver lodes near Nelson, and the gold and copper reefs at and around Rossland. The only distinctly gold mines seem to be the Ymir and one or two more of the smaller mines near Nelson, and the alluvial gravels of Cariboo and Atlin.

Unexplored country; prospecting; new railways.

Perhaps, up to the present, the mining of coal, silver, lead and copper—which minerals have been found in large, or easily prospected lodes—has been the reason that so few gold reefs have been discovered; but, whatever the reason is, both the yield of gold, and the failure to discover new gold mines, is disappointing. A recent report by the Mines Department states, that 300,000 square miles of the country are still unprospected. This area is known to be mineralised. As regards that section which is now being most actively exploited—the Kootenays—mining interests owe much to the Canadian Pacific and Great Northern Railways, which are running branch lines wherever there seems the probability of an ore traffic springing up. Three years ago there were indications that, out of the numerous discoveries then being made, some new gold mines would be found. In those days, however, smelting charges were too high, and railways only tapped a few centres. Now smelting charges are reduced to a moderate figure; there are a number of branch lines [illegible] mining districts; and the cost of working any kind [illegible] deposit can be arrived at. But there are no new gold mines. The older mines are mostly disappointing; people have lost their money, and are not putting more capital into the country. Altogether the outlook for an increased gold yield, commensurate with the country's great mineral area, is not good.

Atlin.

In 1898, as a result of the overflow of prospectors from Klondyke, gold-bearing gravels were found in the creeks of the Atlin district. This far north part of British Columbia is hundreds of miles distant from any of its other mining fields, and is reached by way of the White Pass Railway, and thence by boat along the lakes.

Nature of gravel beds.

In speaking of gold-bearing 'gravel,' especially at Atlin, the word is used relatively. In reality quite half the stones which fill the present and ancient beds of the creeks there are at least the size of one's head, while many of them weigh hundreds of pounds, or even up to several tons. The gravels at Atlin too, are different from those found at Klondyke, 500 miles away. At Klondyke the gravel is of white quartz, with occasional pieces of the bed-rock schist in it, and the gold is not greatly waterworn, but at Atlin the rocks are of close-grained slate, with here and there a granite boulder brought there by glacial action, and the gold is nuggetty and exceedingly waterworn. At Klondyke there is rich ground but no water for hydraulic sluicing; at Atlin there is gravel of only moderate value, but plenty of water, and fair grade for the disposal of tailings.

Compared to Klondyke.

Early days.

Atlin is therefore going to be a hydraulicing field, and, I think, a payable one. In 1898 it was 'rushed' by the alluvial miners, and all the creek beds were pegged out in 100 foot claims. These men worked with varying success. The gold was there certainly, but the ground was not rich, and living was expensive. There was trouble in moving the boulders in the creeks, and many could not be moved at all. Owing to the badly framed-mining laws, and the lack of an official on the spot with power and jurisdiction claim boundaries, there was trouble and endless litigation. time, even, it was proposed to pass a British Columbia by which American miners would have been deprived

Troubles of alluvial miners.

of title to their claims—which non-aliens were promptly preparing to 'jump' from them. All these drawbacks frightened the alluvial miners away, and at the time of my visit (September, 1901), there were probably not more than 500 left. But before this the possibilities of the Atlin district as a hydraulic sluicing field had been sized up. As the individual and his 100 foot claim disappeared, companies and syndicates came in, taking up the abandoned ground or buying out the small holders, and amongst these companies nearly the whole field is now portioned out.

The district and the mines.

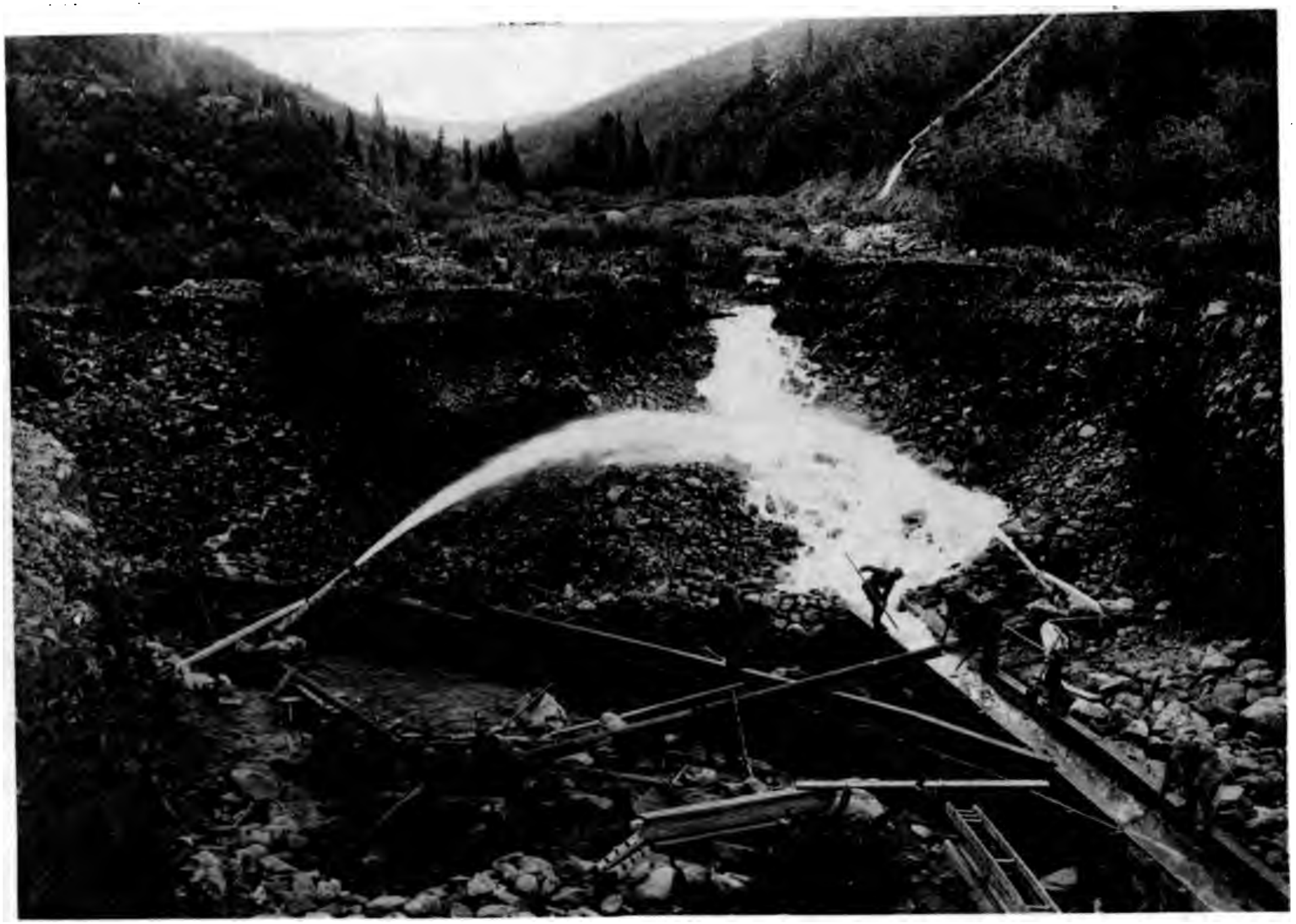
The gold-bearing creek beds lie in an area about twenty miles long and eight wide, and most of this ground is now held by about a dozen companies or syndicates—formed with the intention of hydraulicing. Thus, the Atlin Mining Co. holds McKee's Creek; the Atlin Lake Co. Birch Creek; the Willow Creek Co. Willow Creek; the Sunrise Co. Pine Creek; and a French syndicate, Boulder Creek. There are also two mines on Spruce Creek, and several others elsewhere, that I did not see. This year (1902) several of these mines will show results. I think these will be payable. This will give the needed stimulus to the other companies some of which will have to raise considerable sums of money if they wish to work at a profit.

Hydraulic mining described.

Hydraulic mining is a distinct art. To my mind the laying out of an hydraulic mine is a greater test of capacity than the opening of a quartz mine.

In hydraulic mining there are three main essentials: *gold*; *water power* to force the gravel into the sluices; and *grade* to carry away the tailings. To determine the presence of these on any property, or the being able to bring together these three, often means a series of experiments stretching over several years. An hydraulic property cannot, therefore, be hurried to the producing stage.

But there are so many other questions too. Gold, water, and grade may be there in abundance—all the essentials—but if the questions of ownership of adjoining property, litigation, and finance are looked at, the whole fabric may fall to pieces, and the labour of years be of no use.



HYDRAULIC SLUICING—ATLIN G. M. CO., BRITISH COLUMBIA.

Hydraulic mining and litigation.

The owner of an hydraulic property must not only have title to his own ground, but he must be certain that his mining operations will not interfere with the properties of any one else, either above or below him. This is a rock over which, I suppose, hundreds of otherwise payable mines have come to grief. In California, some years ago, a whole hydraulic industry had to close down because the properties of farmers, many miles away, were being flooded with *débris*; and even in Atlin, at the present moment, there are several bitter law cases because the silting up of tailings from one mine blocks the passage of tailings from another mine.

In bringing in water, too, one property may gain at the expense of another. Then comes litigation—the water is cut off, and the mine—on which perhaps a small fortune has been spent—has to be shut down.

Preparing a mine.

Again, if a mine is to be laid out to the best advantage, there are the years of experiment to be faced. The depth of gravel and nature of the bed-rock have to be tested by innumerable holes, and temporary sluices have to be fitted up for trial runs; surveys have to be made for the bringing in of a head of water, and the volume of water tested the whole year round; the grade for the sluice boxes and the tailings race has to be laid out, or perhaps tunnelled, and the ultimate disposal of the tailings made sure. The Mining Commissioner and the lawyer have to be consulted at every fresh step. All this takes time, and a good deal of money. Directors, who rarely understand technical details, become impatient, and if the shares are weak on the market, the manager will probably have trouble in getting enough money to carry out his original and carefully thought-out programme.

The pitfalls of an hydraulic mine therefore, especially in a country like Canada, where litigation is made a speciality, are legion. It is not surprising to hear that Atlin has already several cases on hand, and that at least one of the mines there is under an injunction to stop working.

English mines at Atlin.

There are two English-owned mines at Atlin the Atlin Mining Company and Atlin Lake G.M. I believe that if these

Atlin Mining Company:

mines are properly handled they will both pay. The **Atlin Mining Co.** owns McKee's Creek. Here, there is a good water supply for six or seven months in the year; a sufficient grade for the sluice boxes, and ample dumping ground for the tailings. The presence of payable gold is said to be proved by the results which the alluvial diggers got from this creek. Here, then, we have gold, water pressure, grade for the tailings, clear title, and no possible interference from other property holders. This ought to bear working at a profit, and probably a clear season's run in 1902 will show this. The minor trouble here is the quantity of big boulders in the creek bed. Many of these are too big to be moved, even by water pressure, and have to be 'bulldozed.' This consists in laying three or four dynamite cartridges on the boulder in question, covering them with clay, connecting them with an electric battery, and firing a dozen or so shots simultaneously. This process is effectual—smashing the boulders to a movable size—but it is expensive. The manager of the mine placed this item at 10 cents a cubic yard of gravel, out of a total working cost of between 30 and 40 cents.

its prospects.

When this company has worked out the creek bed there are big benches of gravel on the hill-side to be sluiced. In any case there is material for a number of years' work, and I expect that the mine will pay reasonably well.

Atlin Lake Company

The **Atlin Lake Co.** also owns a creek to itself, and its workings are not likely to interfere with the property of any one else. On this mine payable gold has been proved by the early alluvial workers, and I saw enough in the cracks of the newly-cleared bed-rock to satisfy myself on that head. There is also a moderately good grade for carrying off the tailings, and a dumping ground. But the trouble here is going to be scarcity of water. The manager told me that with a big supply for two months after the melting of the snows, and with a small supply for the rest of the season, he could uncover enough ground to earn a small profit. But this is not enough. There is reason to think that this mine can pay if it has a proper water supply, and the shareholders should insist on getting this supply. For less than £10,000, I believe, a big head of water can be brought in. The company may drag along for a year or two without it, but it will have to come to this sooner or later, and I believe the expenditure to be justifiable.

The minor trouble here is a bed-rock which is hard to move, and yields up only to careful hand labour the specks of gold lying in its crevices; this bed-rock, too, dips irregularly, and a big 'pot hole' happened upon last year (1901) threw back sluicing for most of the season.

To sum up this mine. I believe that it will, when properly equipped, earn moderate profits for years to come, but not without spending money on an ample water supply. The need for this supply, and the justification for it, will probably be shown by the 1902 season's results with the present head of water.

Willow Creek and Sunrise Companies.

The richest ground at Atlin is probably that of the **Willow Creek Co.** on Willow Creek, and the **Sunrise Co.** on Pine Creek. These properties adjoin, and the creeks junction just below. Here, there is unquestionably gold, and enough water, but only a grade of 2% to carry away the tailings. This means that the tailings of each mine meet each other at the junction of the creeks; that the level of the creeks is immediately raised, and that a batch of men have to be kept there continually to shovel the tailings. The result is that the two companies are in the throes of litigation, and the richest area in Atlin is lying unproductive.

Richest ground at Atlin:

The truth is that below the junction of the creeks there is not enough grade to carry away the tailings naturally—the grade is only 2% as against a required grade of at least 4% —and neither company, even with the creek to itself, could get rid of its tailings without extra labour of some sort. But this Pine Creek and Willow Creek area is too good to be handled by small companies without working capital enough to create a natural grade for the tailings. Some day a capitalist will stroll over this ground and will see its value. Then he will do two things. Firstly, he will amalgamate the two areas of ground, and put up a big working capital. Secondly, he will go to a spot two miles down the creek where there is a high water-fall, and from there he will put in a tunnel which will have a grade of 4%, and which will come up underneath the whole gold-bearing area. Into this tunnel the gravel can be sluiced and carried away, and the property which will then be provided with gold, water, *and* grade will turn out a lot of gold.

how to work it.

Spruce Creek.

On Spruce Creek there is also good ground. An American-owned mine here, the **Columbia,** is expected to be earning profits by 1902.

Future of Atlin.

And so on. I did not see all the creeks in Atlin, but I carried away the impression, that the district will be at least a moderate success for hydraulic sluicing.

Quartz mine.

A number of quartz reefs have been prospected in the neighbourhood of Atlin, but they are no good. The **Nimrod Syndicate** of London opened one of these reefs, but abandoned it. In this, and other cases, the ore was payable close at the surface, but the value died out almost at once in depth. Some 30 miles away there is a mine called the **Engineer,** which shows patches of rich ore, but I do not suppose the general average is payable.

Cariboo.

In the first edition I dealt with the English companies floated to work the alluvial gravels over a great area, of which Cariboo is the centre. These mines up to that time had all been failures, and I can see no reason to alter my opinion about them now.

One can well believe that many of the great beds of gravel found in this country carry, theoretically, enough gold to pay if worked by hydraulic sluicing; but the questions of grade, and more especially water, are almost of equal importance to that of gold contents, and it is here that the failures occur. In any case a mine floated in Cariboo should have a minimum working capital of £100,000 if these troubles are to be got over.

Consolidated Cariboo:

The most interesting mine here is the **Consolidated Cariboo,** a Toronto company. The gravel beds owned by this company are said to amount to 500,000,000 square yards, and the value of this, from the gravel already treated, is 18 cents, or 9d. a yard. It can be treated for a cost of 6-8 cents a yard. Here then is, theoretically, the finest hydraulic mine in the world. It has cost years of work; the erection of a water race 33 miles long; the blasting away of many thousand tons of overburden; and the spending of hundreds of thousands of dollars—or even pounds—to prepare the mine.

In the season of 1900—a season here only lasts for seven months of the year—work commenced in earnest. A yield of $300,000 was taken from the sluice boxes, showing a big profit, and the estimated yield for 1901 was expected to be much greater. But in 1901, one of the factors—the water supply—gave out, and the season's work was more or less a failure.

Its probable future value.

For the future the mine is evidently at the mercy of the water supply. The company has lavished money over this, and every possible precaution was taken to prevent stoppage, but the element of uncertainty is still there. If this is the case with such a mine as the Consolidated Cariboo, after its enormous expenditure, what chance is there for the small English companies with their limited working capitals? Hydraulic mining is excellent in theory, but in practice will, in the end, drive the mine manager into his grave with worry and broken promises.

There is practically no quartz mining in the Cariboo district yet.

Kootenays.

Gold-mining in the south of British Columbia, that is to say in the Kootenays—despite a great deal of vague talk about new finds—is still, for all practical purposes, limited to the mines at Rossland, and those near Nelson.

Rossland.

Rossland, after my second inspection of the mines, gives me the impression of having been one of the worst-handled gold-fields I have ever seen, and a monument to the greatest evils with which mining has to deal.

First of all, the richest ore was picked out and treated. This gave outsiders the idea that the mines were unusually rich, and could keep up the earlier rate of dividends. Consequently, prices went far above their intrinsic value. When the rich ore was gone, it was seen that the mines were really low grade and would need to be worked on a big scale, and with economy, to pay even moderately well. But this meant big outlays on plant and on mine development, which the disheartened shareholders, having already lost their money in the shares, were not able to provide. Then several of the mines, as is the way with mines, went wrong in depth. The War Eagle and Centre Star, for example, which three years ago looked well, are now in a doubtful condition. On the head of this came the London middlemen, floating unproved claims into big companies, bribing newspapers to further their interests, and vitiating public opinion generally.

Mistakes made there.

Finally, a strike, the result of narrowness and prejudice on each side, closed all the mines, and caused for some time almost a complete paralysis.

Two railways wind up the mountain to Rossland, and carry thence the ore to two smelters, a few miles distant on the banks of the Columbia River. Freight on the ore is from 25 to 75 cents a ton; the direct smelting charge is $4·50 to $6; the indirect charge, and losses on smelting, about $2. To this add $4 a ton for mining and placing in the railway trucks, and $2 for mine development (which, in the hard rock found here, is no unusual figure), management, and depreciation. Here we have a total cost of (say) $13 for treating a ton of Rossland ore, which figure cannot be much improved on. A mine having its own smelter, as the Le Roi, and treating a very big tonnage, can work for perhaps $[illegible] a ton, but $13 may be taken as the figure for all the other mines on the field.

Cost of treating ore.

[illegible]

This means that [illegible] averaging $15 a ton, which in many places would [illegible] will show a profit of only $2 a ton [illegible] be worked on a big [illegible]

But while [illegible] are regularly [illegible] of the Le Roi [illegible] this head [illegible]

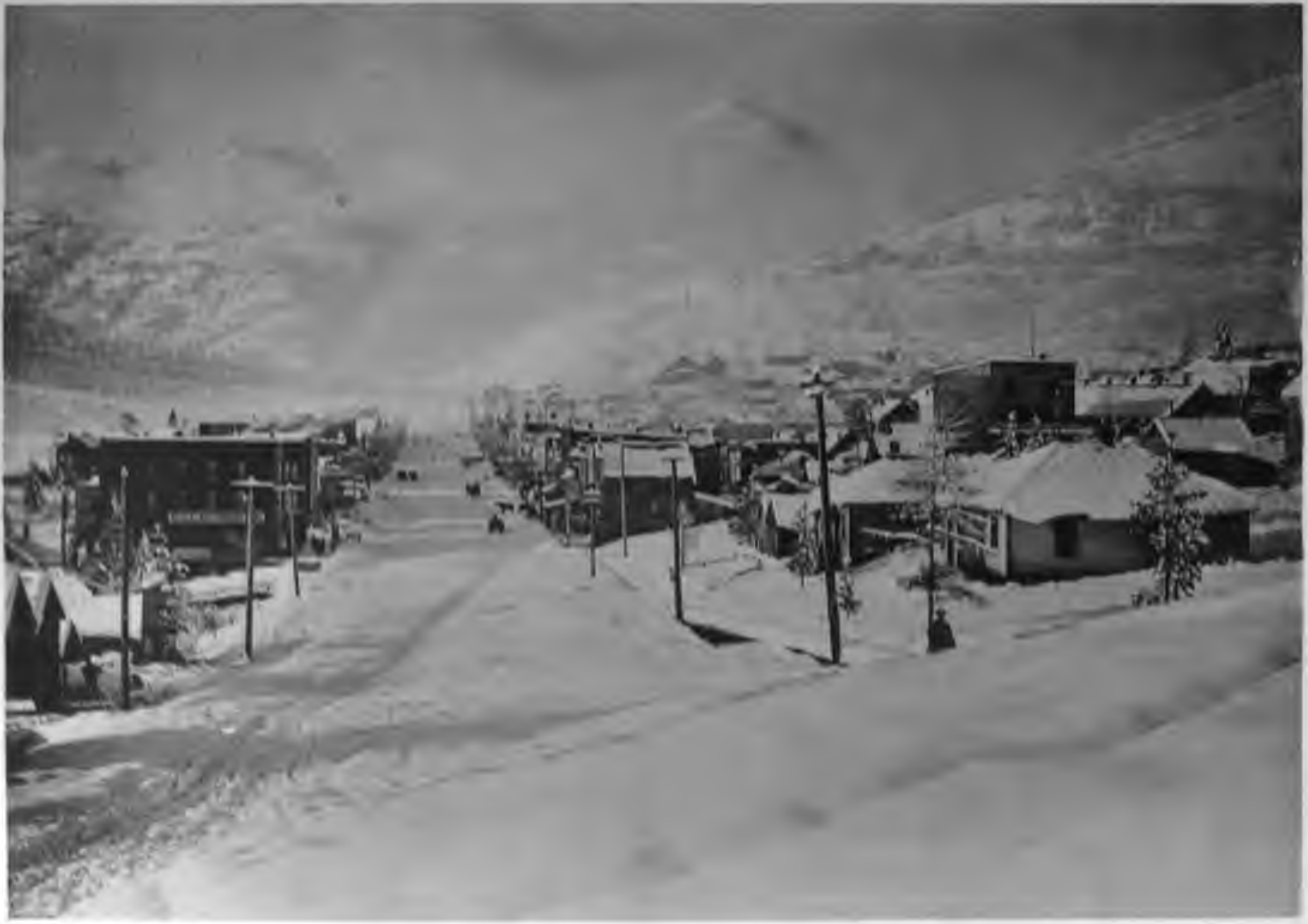


Photo by Carpenter & Miller.

ROSSLAND—BRITISH COLUMBIA.

The Le Roi No. 2, with no great amount of ore in sight, is about \$17·50 average value.

Ore values of the Rossland mines.

The Rossland Great Western, with small ore reserves, is \$13·50 – only 50 cents over the margin.

The Kootenay is not so much as \$13.

The War Eagle has only a little payable ore in sight.

The Centre Star has a great deal of ore, but only a small percentage will yield this figure.

The Iron Mask is only a small producer of ore above the \$13 limit.

The other mines on the field are nearly all shut down.

The future of the Red Mountain, on which the town of Rossland lies, and in which the reefs are found, rests with these seven mines.

Le Roi.

Le Roi is the best of these Red Mountain mines, but in depth has not fulfilled the promise of three years ago. It has turned into a mine of big ore bodies, but these, on the whole, are low grade. Money seems to have been spent like water on its equipment. The result is a surface plant which could hardly be improved on. The main shaft is sunk on the reef, and its present depth is 1,050 feet. It has four compartments, and can handle 100 tons of ore an hour. The hoisted ore, after passing through a crusher, is carried over a sorting belt, and falls into a 1,000 ton bin. From here it is emptied, through a shoot worked by compressed air, into buckets on an aërial tram—driven also by air—and, being carried down the mountain, is dumped automatically into another bin, and from there runs into the railway trucks, which carry it to the smelter. The whole cost of handling a ton of ore, from the bottom of the mine to the railway truck, including hauling, breaking, sorting, and conveying down the mountain is only 16 cents. The air compressors, steam engines and machine shops are in keeping with the rest of the fine equipment. In the mine itself, there are now levels at 800 and 900 feet, and a new level is being started at 1,050 feet.

Surface plant described.

Ore in sight.

The ore in sight, between the surface and 900 feet, is estimated at about half-a-million tons, worth $12 a ton. Cross-cuts put in from the present stopes are likely to cut other lenses which will increase this tonnage.

Ore reserve should be 1,500,000 tons.

As regards the permanence of the lodes in depth, there seems to be, so far, no certain falling off in either quantity or value. But these Rossland lodes are replacement veins, not fissures, and their continuance to a great depth cannot be taken for granted. They are capricious in the extreme, both in size and value, and can never be assumed to exist one foot beyond where they are exposed. Hence the necessity, in a mine like the Le Roi, for keeping a big ore reserve in sight. If an output of 1,000 tons a day is to be kept up, such a reserve should stand at at least 1,500,000 tons.

The Le Roi smelter is an asset of great value. Owning it, and being able to treat a big tonnage, the mine can work at a total cost of $9 a ton, or $4 a ton less than the other mines at Rossland. It must be remembered that the Le Roi ore, as with all the other mines at Rossland, yields gold, silver, and copper; this kind of ore could not be treated except by smelting.

Cost of treatment.

The approximate cost of treatment may be stated as follows:

Development of ore	$ ·40
Mining	3·00
Hauling, breaking, sorting, and freight to smelter ...	·60
Smelting, and loss of metal in smelting	4·50
Realisation of matte, management, general expenditure and depreciation	·50
	$9·00

Estimate of profit.

The mine, as now equipped, can produce 1,000 tons a day of $12 ore. This would give a profit of $2·50 a ton, or, say, a theoretical profit of £150,000 a year. As to whether the mine can go on earning such a profit for, say, five years, will depend upon the ore values to be found in depth. At present the reserves represent less than two years' work. Had it not been for the fact that the War Eagle and Centre Star mines, adjoining the Le Roi, have got into poor ore in depth, I should have said that the prospects of the mine were favourable. The only way to make quite certain of the future is to develop far ahead, and, by this means, neutralise the danger of putting too much faith in a 'replacement' vein. In the meantime, investors should not buy the shares.

Le Roi No. 2.

Le Roi No. 2 was floated to take over the Josie, Annie and Number One claims belonging to the British America Corporation. At the time of flotation there was a small amount of ore exposed in each of these claims, but nothing to correspond with the great amount of development work put in, and the big sums spent in looking for this ore. This means that these claims, although they adjoin the Le Roi, are in badly broken country, and the reefs which exist are contorted and unreliable. But after work on the new mine had been in progress some time, a new body of ore was cut at the 500 foot level in the Josie, showing more ore, and a better value, than any of the previous finds. This ore body, now being mined, I judged to be about 160 feet long, with an average width of 10 feet. How high it goes is not known. I do not think it goes right up to the surface, as the ground above is badly faulted, but it probably continues to some depth. In any case the prospects of the mine are a good deal improved. The other ore bodies in the Le Roi No. 2 I do not think much of; there is some ore on the 'Poorman' chute, and also in the 'Number One' claim, but the new discovery is the only asset of importance. From the bottom of the mine, 700 feet, a cross-cut is being put in to tap the new lode. If it is found there, the shares will no doubt go to £5. In the meantime I place their speculative value at £2–£3.

Speculative value of shares.

The average value of the mine, from over 20,000 tons of ore smelted, is $17·50 a ton. The manager expects, from the ore in sight, to send 200 tons a day to the smelter. As to

a big sum of money must be spent in mine development, which may fail to improve the position. This has been a well-worked mine, but the vital requirement of mine development has been sacrificed to the wish to pay away profits. It is the old story: a mine's interests made subservient to the Stock Exchange.

Centre Star

The **Centre Star** is the mine, above all others, which should have done well. Its lode is the direct continuation of the Le Roi, and in that mine the ore was good right up to the Centre Star boundary. Moreover, the lode was of great size. But the payable ore extended only a little way into the Centre Star, and, worse still, it dipped rapidly into Le Roi, leaving a big unpayable mass of ore in its place. Further from the Le Roi boundary, I believe, more payable ore has now been found, but the mine is not what it looked to be in 1898.

Iron Mask.

The **Iron Mask** is still only a small producer, and I do not think it will become a permanent profit-earning mine.

Velvet and Portland.

Some distance from Rossland are the **Velvet** and **Portland** mines. These have small bodies of ore of moderately good value, but are handicapped by having no railway connection with a smelter. Their prospects are not good.

Nelson district.

Round about Nelson the gold mines have turned out almost as disappointing as those at Rossland. Here the ore does not contain copper, and is treated by the usual stamp mill and cyanide. But with the exception of Ymir, the reefs are too small to be any good.

Duncan Mines.

The **Duncan Mines,** after floating off the Granite claim, appear to have re-absorbed it, and also the Poorman mine. My inspection of these mines in 1898 did not leave a favourable impression of their value, but possibly new discoveries have been made.

The **Fern, Dundee,** and **Porto Rico** mines seem to have passed into obscurity.

Athabasca.

The **Athabasca** mine paid a 5% dividend in 1900. Shareholders in a mine like this, where the reef, though of good value, is small and broken, must remember that unless there is ore actually in sight which will yield a profit approximating to market value, the shares have not an intrinsic value.

Ymir.

Ore reserves.

Finally, the **Ymir** mine, always a sound-looking and well-handled property, is turning out really well. Now is the time, in the history of this mine, for shareholders to insist that, instead of an increase of dividends, the extra profits, for a year or two to come, shall be put into mine developments. I should like to see the Ymir with eight to ten years' ore in sight. Shareholders may take it for granted that that is a far surer way of making their shares valuable than by the payment of increased dividends and the keeping of only a two years' reserve of ore. Some day the Ymir, like all other mines, will come to an end in depth. Even now, on the quantity of ore in sight, the shares are too high.

CHAPTER X.

THE GOLD MINES OF THE UNITED STATES.

United States gold production.

THE production of gold in the United States and Alaska has increased much of late years. In 1892 it was 1,596,375 fine ozs. Since then there has been an increase every year, and in 1901 the total reached over 4,000,000 fine ozs.

Gold as a by-product in many mines.

If this yield is analysed, it will be found that about 450,000 ozs. of gold are yielded as a minor product by various silver, lead, copper, and zinc ores.

The gold mines themselves, too, that is to say the mines in which gold is the chief product, usually produce some other metal or metals to a greater or less extent. A gold mine in, say, South Africa, Australasia, or India, only yields gold and a very little silver associated with it. But in the United States this simple class of ore is not often found. Outside of Colorado, California, South Dakota, and Alaska, there are few simple gold ores.

Metallurgical treatment.

The usual gold-bearing ore in the States, being either of a refractory nature, or associated with various other metals, is not treated by stamp mills, but by smelting or roasting ; af
it is chlorinated or cyanided. The cyanide process ha
strides here in the last few years ; relatively, better
than even in South Africa, and to its succes
large part of the increased gold output.

A further analysis of the gold yield ot
that there are only a few gold mines of a
the yield comes from small producers.

The notable mines are:—

Notable gold mines in the States.

In South Dakota, the Homestake; in Colorado, the Portland, Stratton's Independence, Gold Coin, Camp Bird; in Utah, the Consolidated Mercur; and in Alaska, the Alaska Treadwell. California has at present no notable mines.

The output of gold is likely to increase.

This group of big mines cannot compare with the mines in the square mile at Kalgoorlie, still less with those in and around Johannesburg. But of course the gold-mining future of the States is filled with boundless possibilities. In every other metal—silver, lead, copper, zinc, also in coal and iron—it well-nigh controls the world, and my belief is that its production of gold will still go on increasing.

The gold-producing States—

The principal gold-producing States, in the order named, are Colorado, California, South Dakota, and Montana. To these must be added the territory of Alaska.

The *Engineering and Mining Journal* of New York gives the following estimate of gold production for the year 1900:—

in their order of production.

		$
1.	Colorado	28,762,000
2.	California	15,650,000
3.	Alaska...	7,531,000
4.	South Dakota...	6,625,000
5.	Montana	5,150,000
6.	Utah	4,140,000
7.	Arizona	2,725,000
8.	Idaho	2,067,000
9.	Nevada	2,023,000
10.	Oregon	1,640,000
11.	All other States	1,845,000

Mines inspected.

I inspected 40 mines in Colorado, California, South Dakota, Montana, and Utah, also 7 in Alaska, which country I have dealt with in a separate chapter.

English capital in American mines.

English investors are not greatly interested in American gold mines, and in the few they do hold they have, on the whole, done badly. The American is a shrewd judge of a mine. If it is any good he will work it himself, or with a small syndicate. Many profitable gold mines in the States are entirely in the hands of a few shareholders, sometimes only of a single owner. When the mine begins to be worked out, or at least when the cream of the ore is gone, the owners begin to think of selling. Sometimes they float the mine in one of the Eastern States; but if it is a gold mine, they look preferably to London.

Some methods of selling American mines to England.

If the mine happens to have a good deal of ore developed, the vendors ask for double the net profit in sight—an outrageous basis of valuation—and I am sorry to say we are often foolish enough to pay this price.

If the mine has hardly any ore in sight—if it is almost worked out—any price at all is too much for it. This sort of mine the manipulators will float—in London—as a going concern. They will have so arranged that there is a year or eighteen months' good ore still left in the mine. The mine thus is able to pay dividends from the day it is floated—which attracts numerous small investors to the shares—and long before this block of payable ore is finished, the vendors and middlemen have been able to do all they wanted.

American mining capitalists and their methods.

The big mining capitalist in America likes to get hold of a gold mine that he can develop and work himself. Into such a mine—if it shows promise—he will sink a great deal of money. But having done this, and taken the risk, he is for ever afterwards in absolute control of the mine and its policy. It is his cinch. Even if the mine is put on a share basis, and the bulk of the shares sold to small holders, he still retains the control. Anyone who wants information must go to him, and ask it as a favour—and then, if it is important information, the chances are ten to one that he will not get it.

American shareholders seem to be satisfied with this sort of thing, though personally it would not suit me. I do not say that these men are necessarily dishonest; often they are not. But it is an understood thing that the strong, moneyed man in the States can do whatever he likes; so he is really beyond criticism.

These men are a law unto themselves. Printed on the doors of American mine buildings you often see the words:

KEEP OUT.
THIS MEANS YOU.

I have sometimes, while reading this notice, expected the 'boss' to walk round the corner and say, 'Here, you! I've made my fortune, and this is my mine. It makes me tired to look at you. Get out.'

I found mine managers in the States always civil and willing to interest a visitor. But about the giving of real information—unless by instructions from headquarters—they are bound hand and foot.

Mining litigation.

A great blot on mining in the States is the amount of litigation it leads to—only too often the result of thinly-disguised blackmailing. Some mines and districts seem never free from injunctions. At the root of much of this is the hateful extra-lateral rights system of holding claims.

The extra-lateral rights law.

In nearly all countries a claim is contained within vertical boundaries, drawn downwards, and only ore inside those boundaries belongs to that claim. This is a clear definition, and can lead to no litigation. But in the States, only the *end lines* of a claim and their projections are actual boundaries, and a reef outcropping in the claim may be followed down over the side lines as far or as deep as ever it goes. But if this reef twists or faults, or were to come to the surface again further on, there is sure to be either a lot of blackmailing or several lawsuits—perhaps protracted over years, and eating up all the profits of the mine—before the thing is adjusted. As witness the position at Butte to-day!

I cannot understand why in America—the great common-sense country of the world—such a law as this remains unrepealed.

Colorado.

Colorado is by far the most important gold producer of the States, as the figures already quoted show. This State produces not only gold, but silver, lead, copper, coal, and iron.

Variety of minerals mined.

The gold mining districts.

All its metal mines are found high up in the mountains—either on spurs, or along the main range of the Rockies. From north to south, along the mountain range, the chief mining camps where gold is produced are Boulder, Gilpin, Leadville, Cripple Creek, and the San Juan.

Gold first discovered in Colorado. Gilpin County.

Output to date.

Depth of the Gilpin mines.

The first discovery of gold in Colorado was in 1859. This was up in the mountains, in the locality now known as Gilpin County. Since that date Gilpin County, from a mineral belt four miles long and three wide, has produced over $100,000,000—mostly in gold. These lodes have been worked continuously for over forty years. Owing to the great number of lodes traversing the belt in all directions, local mining companies have preferred to work a number of reefs down to a comparatively shallow depth, rather than one or two reefs to a great depth. There is only one shaft below 2,000 feet; most of the other deepest shafts range from 1,200 to only 700 or 800 feet. This compares poorly with the record of another old mining field—Bendigo—where there are dozens of shafts below 2,000 feet, and quite a number below 3,000 feet.

This shallow mining at Gilpin is the more surprising because the reefs certainly continue in depth, and I believe there is no appreciable falling-off in value either. In the **California** mine—where the shaft is 2,200 feet deep—there is payable ore in the bottom, and in all the shallower mines there seems to be still good ore at the lowest points.

Cook mine.

I inspected the **Cook** mine, as a typical mine of the Gilpin district. On the lowest level—the 800 foot—the reef was highly mineralised, and of payable value. I would describe the prospects of this mine, and of the bigger consolidation of which it forms a part, as quite favourable.

Gilpin County prospects.

Gilpin County mines need, and I think deserve, more working capital. This should be spent solely in mine development. In the past everything has been done from hand to mouth, and at present there is no reserve of ore in the mines. But the ore is there, and only needs to be developed.

Production of Gilpin Boulder and Clear Creek.

With Gilpin may be coupled the adjoining Boulder and Clear Creek counties—in all of which the mines are situated up among the mountains. This combined goldfield yields at present gold to the extent of about 140,000 fine ozs. a year.

The Newhouse tunnel.

Reefs cut in the tunnel.

At Idaho Springs, in Clear Creek, I inspected the Newhouse tunnel of the **Argo Mining and Transportation Company.** This is quite an important work. Started in 1893, and continued irregularly, it is now in nearly 2½ miles. The size is 12 feet wide by about 10 feet high, and the present rate of progress 260 feet a month. The tunnel has already cut the veins of several mining companies—at 1800 feet below the present workings of those companies. These lodes are well-defined and carry heavy seams of mineral, but on the whole are of low grade. Very little lateral driving or stoping has yet been done on these, so that it would be unfair to say that all the ore found at this great depth will be low grade. One of these reefs, that belonging to the **Sun and Moon** Company, is producing 60 tons of ore a day at, I presume, a profit. On this ore, which of course is carried out through the tunnel, a royalty is paid to the Argo Company.

The future of the Argo Company.

The face of the tunnel was in lode matter the morning I was there. This particular lode is in ground belonging to the Argo Company, so that if the company cuts a payable vein its prospects would be much improved. When the tunnel is carried still farther in, it will cut some of the best of the Gilpin County reefs. If these are found to hold their value at this depth—equal to over 2,000 feet vertical—attention would be drawn to this district.

Reefs of the district described.

The lodes all over the district are true fissures, and undoubtedly go to a great depth. Their nature is quartz, with heavy mineral showing through it. Sometimes there is a solid band of mineral. This is usually of iron pyrites—more rarely of copper pyrites—with galena, and when in this condition, is sorted out by hand and shipped to a smelter. This picked smelting ore sometimes runs up to a value of $100 a ton—nearly all of which is gold—but the average value is not so high. The low-grade main body of the lode is treated by stamp mills and amalgamation, and the tailings are concentrated. These concentrates are also shipped to a smelter. Taking the average of the whole bulk of ore mined, it is probably not over $10 a ton, but at that figure a profit can be made.

Their treatment.

On the whole I think this district—that is to say, the mines of Gilpin, Boulder, and Clear Creek counties—is by no means worked out yet.

Leadville.

Leadville, as a mining district, has produced a greater value in metals than any other in Colorado. But of this only a small quantity has been gold; the mines are essentially silver, lead and zinc; copper and gold are minor products. The total value of ore produced by Leadville mines to the end of 1901 is over $280,000,000.

Gold produced as a minor product.

Ibex mine.

One mine, however, the Little Johnnie, belonging to the **Ibex** Mining Company, is a big gold producer. It has yielded 60% of its values in gold, and has been a valuable property. My inspection of the mine gave me the idea that most of the best ore is now worked out. The richest gold was found in the carbonate ores; in the heavy sulphides now being worked there is probably more silver present and less gold. All the ore is smelted.

There are one or two small gold mines in the district, which may turn into something good, but I did not see these.

Discovery of Cripple Creek.

Johannesburg was discovered in 1885, Cripple Creek in 1891, Kalgoorlie in 1893. These, in the order named, are now the three most important gold-mining fields in the world. Cripple Creek, according to local statistics, produced $22,500,000 in 1900, and is expected to yield $25,000,000 for 1901. I am told that these figures are inaccurate, and that the actual yield at present is not more than $20,000,000. It is a pity that the mines do not furnish sworn declarations of their monthly yields as they do in the English Colonies.

Description of the field.

The mines at Cripple Creek, which extend over a length of five miles, and a width of perhaps three miles, lie on the sides of the mountains at an average elevation of nearly 10,000 feet.

In the distance can be seen the snow-capped main range of the Rockies, and Pike's Peak is within an easy walk.

The formation is volcanic. In the heart of the gold belt is the vent of a crater, or several craters, but the precise locality of these has not yet been determined. The volcanic rocks—except in the actual craters—are, in turn, underlaid by granite. In the centre of the area the granite has not yet been reached, but near the sides of the basin the deeper shafts have all met with it. Several of the mines are located entirely in the granite.

Geology of the field.

It is a hotly-debated question as to the effect the granite will have upon the gold in depth. The permanency of the whole goldfield is hinged on this. The mines in the centre of the basin may never find granite, or only at a great depth. The shafts of these mines are now down in the volcanic rock to depths of from 700–1,500 feet, and, on the whole, the ore is still of good value. The mines on the rim of the basin meet the granite invariably as it dips towards the basin's centre, and at each successive level have less and less of the volcanic rock. These mines are facing a problem, the answer to which will not be known for several years.

Volcanic rocks and granite.

There is, I suppose, no doubt that the solutions from which the gold was precipitated came up through the volcanic rocks, and although the fissures, or cracks, through which they ascended continue also into the granite, one does not expect to find the gold thus continuing—at least no great distance.

In one mine, Stratton's Independence, the lode gets poor directly it enters the granite.

In the adjoining Portland mine there has been a lot of good ore found in the granite, but never at a great distance from the junction of the granite with the volcanic rocks. I believe that in the deeper workings of the Portland the ore found in the granite is of poorer value.

Influence of the granite.

In another adjacent mine, the Gold Coin, *all* the ore seems to be in the granite, and yet the mine is, up to the present, a very good one, and opened to 1,200 feet deep.

CRIPPLE CREEK
LOOKING EAST

These examples show the hopelessness of geologic theory. 'Where the gold is, there it is,' says the Cornishman; and this is as true in Cripple Creek as in every other mining camp in the world.

The field's future.

On the whole, the future of the field, to a moderate depth, seems to be all right. I inspected eleven of the best mines, and took special note of the lowest workings in each. The Stratton's Independence is certainly disappointing in the bottom; but all the rest, including the Portland, Elkton, Vindicator, Golden Cycle, Mary McKinney, Gold Coin, etc., etc., showed no material falling off. These mines varied in depth from 700-1,200 feet.

Nature of the gold veins.

The overlying rock of the volcanic basin is an andesite-breccia. Through this run dykes of phonolite and basalt, which, when they lie close to the lodes, often carry high values in gold. The lodes themselves would, in any other part of the world, be classed as waste rock; the value is carried almost entirely in the minute fractures or cleavages, and the body of the lode, outside of these, is rarely payable. The gold is generally present in the form of a telluride—sylvanite and calaverite being the commonest forms. In some mines, Stratton's or Mary McKinney for example, the lode can be more easily distinguished, but even in these it is generally very small, and the cracks and fractures in the rock on each side of it still carry a big proportion of the values.

Mine equipment is good.

I found nearly all the mines well-equipped with a good shaft house and shaft, and with hauling engine, air compressor, pumps, dynamos and boiler plant, all of the best. The underground work—with narrow veins, and much dead work in cross-cuts and the like—is costly, but it seemed to be done well. Fortunately the walls stand with little timber.

Ore-sorting carelessly done.

But the system of ore-sorting on most of the mines struck me as being wrong altogether. In many cases the ore is sorted in quite a haphazard way—without even being washed—and there is big waste under this head. It must be remembered that most of the value is in the very finely broken ore or dust.

[illegible] that the [illegible]

[illegible] transport [illegible] them. [illegible]

[illegible] treatment of Cripple [illegible] refractory, has to to be smelted or chlorinated, and is sent either to Colorado Springs, Florence, Pueblo or Denver. Three railway companies divide the business, and about half-a-dozen smelting or chlorinating works.

It is quite evident that these railway and treatment companies have an arrangement by which they keep up prices; the consequence is that Cripple Creek ores are made about the most expensive gold ores to treat anywhere in the world.

A reef running $15 in Cripple Creek to-day—ten years after the field's discovery—is practically unpayable, and on many of the smaller mines the costs are much over $20. The cost of shipping ore varies. The minimum charge is $7 a ton on ore running up to 1 oz. in value, but as only a small portion of the tonnage shipped is of as low value as this, the figure can hardly be used for comparison. The average value of ore shipped—that is, ore sorted out from the greater bulk mined—assays from $25–$35 a ton. The cost on this is not less than $9 a ton. This may be divided up as follows:—

Average total cost.

Sampling	$ ·75 a ton.
Railway charge	1·50 ,,
Treatment and loss of gold	6·75 ,,

If to this be added a cost of $7 for mining, development, management and depreciation, we get a total of $16 a ton as cost of treating Cripple Creek ores.

The loss in treating ore worth 1–1·5 oz. should not be more than $1 a ton, so the actual treatment charge may be reckoned at $5·75 a ton.

Costs of individual mines.

To verify these figures I give the costs of several of the mines I visited. Stratton's Independence, $16·50 per ton; Portland, $13; Golden Cycle, $14; El Paso—on a small tonnage of very rich ore—$29; Mary McKinney, $16; The Portland Company is erecting its own chlorination plant at Colorado Springs. It also owns bonds in the new railway which is to carry the ore to its works. The report for 1900 s that on this treatment of its own ore the Portland Company expects to save $300,000 a year. This is equal to about $2·50 per ton!

Comparison of costs—Cripple Creek and Mount Morgan.

Rich ore and high costs always go together.

Now compare these costs, with a mine which also has to use chlorination—with Mount Morgan. By a curious coincidence I inspected the Cripple Creek mines in company with the manager of Mount Morgan, and we discussed the comparison. There the ore contains over 10% of sulphur, and is costly to roast, but at Cripple Creek there is probably not 2% of sulphur present; wages are about the same. Treatment of the sulphide ore at Mount Morgan costs 15s. a ton—$3·70—whatever its value; and treatment of Cripple Creek ore of, say, a $40 value, excluding sampling, freight, and loss of gold in treatment, costs $6·50. The comparison is a fair one. It shows how exorbitant are the charges made by the public ore treatment companies, to say nothing of the railway charges. The total cost per ton on Mount Morgan ores, oxidised and sulphide, with everything included, is about $5, and the average value of its yield is $15 a ton. For years past, on about this grade of ore, it has paid nearly £1,000 a day in dividends. But if the costs were what they are at Cripple Creek, Mount Morgan would be worked at an actual loss! Of course costs may be expected to get gradually less, but at this stage of the field's history they should already have been brought lower. When mines deal with such rich ore as is found at Cripple Creek, there is always a laxness about costs, and, no doubt, local mining men, accustomed to the high rate of charges, do not realise that anything is wrong. Personally, the high charges for treatment, combined with the method of sorting the ore, left an unfavourable impression on me. Cripple Creek, in these respects, is, as yet, in a backward condition.

Gold stealing.

There used to be a lot of gold stealing, especially of the rich patches of telluride. I had a talk with a detective on one of the mines, who had rid his company of this sort of thing. He used to crawl through the stopes without a candle, and would now and then come upon a miner in the very act of transferring some choice, rich morsel to his pocket. One day five men were searched and were found to have secreted, under their clothes, telluride worth a small fortune. The culprits, whenever discovered, the detective being a powerfully-built man, were dragged to the surface by the scruff of the neck, and assisted off the property, minus their pay, at the point of the detective's boot. There are no thefts in that mine now.*

Good standard of labour.

The standard of labour in the mines is particularly good. Most of the miners are English-speaking, and there is almost an absence of the Irish agitators, and of the Slavs, Finns, Austrians, and Italians, who give so much trouble elsewhere. Labour unions are not officially recognised on the field, and no distinction is, therefore, made between union and non-union men. In the early days there was a big strike, brought about to compel recognition of the unions, but the mines were promptly closed down, and ever since then agitators have failed to gain a hearing with the majority of the miners.

Unions are not recognised.

All the mines have printed notices saying that they do not recognise the unions, and that intimidation of non-union men will not be allowed. The Portland mine has a notice stating that the moment its employees begin to agitate the mine will be closed down. This gets to the root of the question. It shows the miners that the company is not afraid to close its mine, or to stop earning dividends. The shareholders can make this sacrifice, but the miners cannot—therefore they think twice before going on strike. It may be mentioned that the miner at Cripple Creek gets a minimum of $3 for an eight hours' day.

A summary of the yields from different mines.

To briefly summarise the Cripple Creek field, it may be said that there are two big producers, Portland and Stratton's Independence, and a dozen or more large mines which produce regularly. The two big mines turn out about 14,000 and 8,000 ozs. a month, respectively. Such mines as the Gold Coin, Elkton, Vindicator, Strong, Golden Cycle, El [illegible]

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* I have been told that a man who attempted to interfere in [illegible] stealers would be promptly killed. If this is so, my friend the [illegible] liar.

Mary McKinney and Doctor Jack Pot produce from 1,500 to 5,000 ozs. a month. There are several privately-owned mines which have good yields, but exact figures about these are difficult to get. Then there are numerous mines that produce irregularly. These mines do not turn out much ore, but their small product is usually very rich, and their aggregate forms a considerable proportion of the field's total yield.

Tributors.

Many of the smaller mines, and also unprospected or worked-out areas of the bigger mines, are leased out to parties of tributors. This is a sound idea. The minute veins in which the telluride is found run in all directions through the volcanic rocks, and the only way to find many of these veins is to cross-cut the whole country, and patiently follow up even the smallest discovery of value. In work of this kind the tributor shows to advantage, and already to his credit belong many valuable finds all over the field.

General conclusions

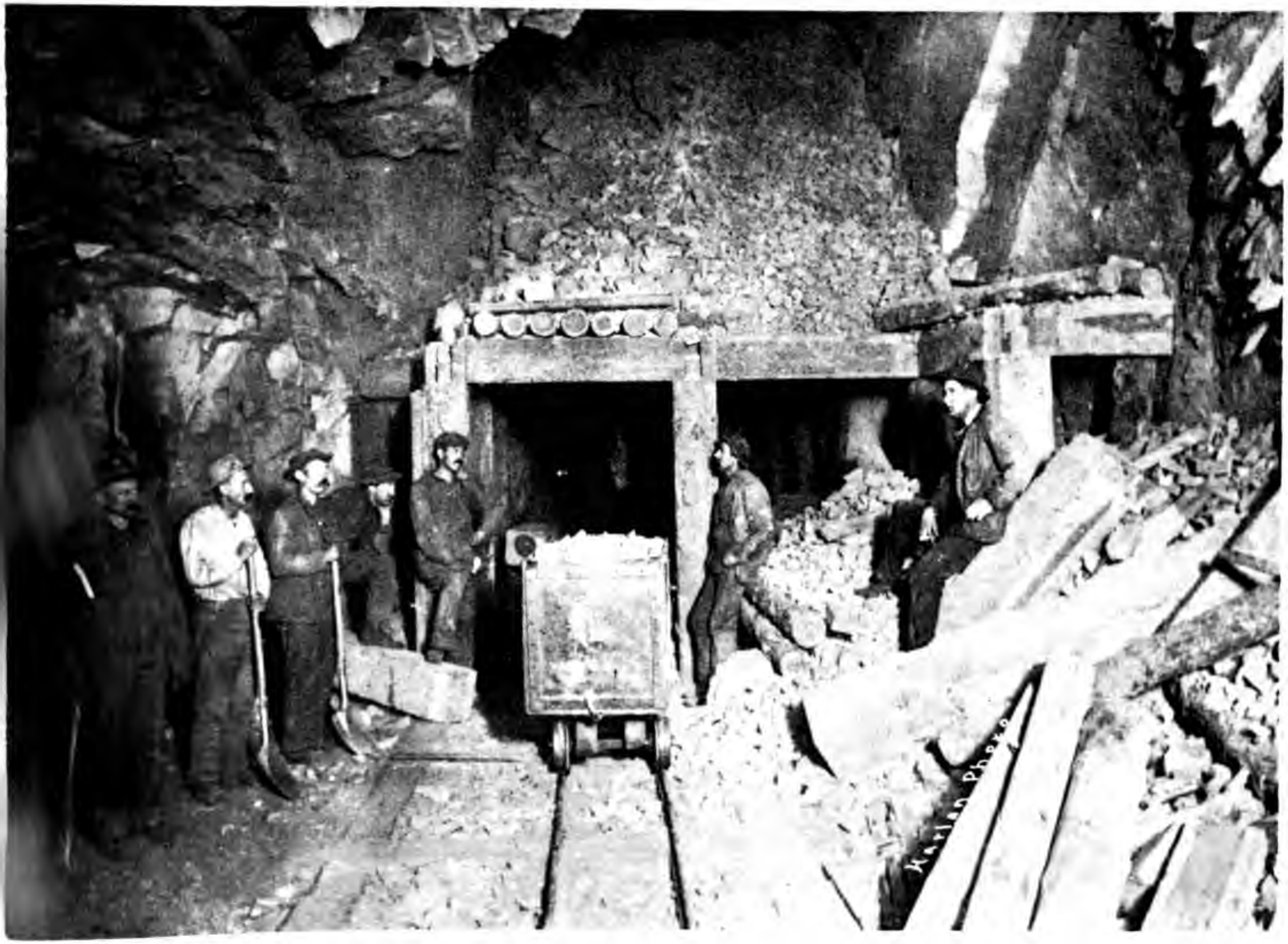
As I said before, I think the future of Cripple Creek is assured for some years ahead. Of course the veins may go down payable to several thousand feet, and the mines may last for fifteen years to come. But to say that, on present developments, would be mere guess-work. Some of the mines, as is already the case, will be failures; and some of the smaller mines now may actually become the biggest; but on the whole, the present outlook is satisfactory.

Share values are too high.

Nearly every mining share in the world stands perpetually above its intrinsic value—even the shares of the best mines. Cripple Creek shares are no exception to this. I suppose that at to-day's prices the shares of Mary McKinney, Vindicator, Golden Cycle, and perhaps Elkton, Jack Pot, El Paso, and Portland may eventually turn out all right, but I am sure the present ore reserve in these mines is not at all equal to the market value of the shares.

Portland.

The **Portland** Gold Mining Company is the largest gold producer in Cripple Creek, the monthly output being about 14,000 ozs., fine gold.



PORTLAND MINE, CRIPPLE CREEK. DRIVE ON 800 FOOT LEVEL.

Lowest levels.

A saving by treating its own ore.

To date this mine has paid over four million dollars in dividends. I inspected the lowest workings, at 1,000 and 1,100 feet, and I am correct in stating that, on ore actually in sight, the mine will do very well for some years to come. The company is building its own ore reduction plant at Colorado Springs, and has also taken a considerable share in the new Colorado Springs and Cripple Creek railway, which will carry the ore from the mine to the mill. It is estimated that the Portland Company, by thus treating its own ore, will save $300,000 a year. This is equal to probably $2·50 per ton treated. The last yearly report of the company's consulting engineer states that, with its own treatment works, the present waste dumps can be profitably worked. These include a very big tonnage.

Capital and value of the shares.

The Portland Company has, at the present time, a strong cash balance—something like $500,000, to which must be added the railway bonds, estimated as having cost $160,000. Most of this cash will, no doubt, be spent on the new works. The capital is 3,000,000 shares of $1 each. These stand at $3, making the mine's capitalisation nearly two millions sterling. The present dividend is $720,000 a year, equal to 8% on the market value. This is, of course, far too little; and as there is not ore in sight of a value at all equal to the market price, I can only consider the shares as standing too high. Nevertheless it is a great mine.

After the Portland, as a gold producer, comes Stratton's Independence, with about 8,000 ozs. a month; this mine I have described under the list of English-floated Cripple Creek mines.

Gold Coin.

The third largest producer is the **Gold Coin**; from this mine the output probably averages 6,000 ozs. of fine gold a month. The main lode and its branches are now developed to 1,000 feet deep, and worked out to 600 feet. The lodes are pure granite—similar in all respects to the county rock—but carry the minute seams and fissures in which are found the tellurides. The immediate future of the mine looked to me to be good, but, of course, like all the mines, the shares are standing far too high. The surface and shaft equipment on this property, for a mine that turns out only 3,000 tons a month, is very fine indeed. I do not think I ever saw a better on a mine of its size.

uipment.

El Paso.

The **El Paso Mine** was being opened up at the 600 foot level. The chute of payable ore there is 300 feet long. This is an amalgamation of several mines and other reefs exist on the property which were not [illegible]rked at the time of my visit. About 1,200 tons a mon[illegible]d to the surface; this is sorted by hand down to 400 t[illegible]verage value of $100 a ton; mining and development c[illegible]out $20; freight and treatment (on a sliding scale for rich ore) [illegible] $14. The total profit is, say, $65 a ton, equal to $26,000 a mo[illegible]. Beginning in January, 1902, the El Paso Company expects [illegible] pay 1% a month, absorbing $25,000. The ore reserves do not nearly approximate in value to the market price.

Ore reserves.

Mary McKinney.

The **Mary McKinney** was being driven at the 500 foot level, and has some ore still to be stoped above the 400 level. At the 500 level the ore seems to run the whole length of the property, 3,000 feet. In places there are two veins. The aggregate width of ore, after 40 or 50% has been sorted out, is about 2½ feet. That mined has a shipping value of about $45 a ton. Total costs may be estimated at $16 a ton, leaving $29 profit. An estimate of ore in sight above the 500 foot level, would be 55,000 tons. If all this was payable it would give a theoretical profit of $1,600,000—equal to the market value of the mine; but of course it is not all payable—the 3,000 feet stretch of reef carries poor patches in it. Nevertheless the Mary McKinney is a really good mine.

Ore reserves

Anaconda.

The payable chutes of ore in the Mary McKinney appear to be dipping into the **Anaconda.** I inspected the lowest workings on this mine, but as yet they are not sunk deep enough for the good ore that may be expected at a greater depth.

Doctor Jack Pot.

In this same locality, I saw the **Doctor Jack Pot Mine.** Good ore is found here, but it occurs irregularly, and the future of the mine seemed to me to be only moderately good.

Elkton.

The **Elkton** mine is at present one of the best on the field. At the 700 foot level, the lowest at the time I was there, the ore was still of good value and width, and the future seems assured for some years to come. A good deal of the gold in this mine occurs in basalt dykes. But the market value of the mine, nearly a million sterling, like most of the other mines at Cripple Creek, is distinctly too high.

Vindicator.
Golden Cycle.

Two almost adjacent mines which I saw, lying in the heart of the volcanic rock, are the **Vindicator** and **Golden Cycle.** Each of these mines is now opened to between 800 and 1,000 feet deep, and at these levels a good deal of payable ore is met with. The gold in these mines is carried in the veins and cleavages only; there is no reef matter at all, and any one unacquainted with the formation would, at the first glance, pronounce it to be worthless. At these mines I saw the best ore-sorting plants on the field.

Gold found in thin veins.

It is hard to believe that these knife-edge veins will continue to carry payable gold to a great depth, but as yet there is certainly no sign of any falling-off in values. Each of these mines is likely to do well for the next year or two—on the working of ore now in sight.

English-floated mines:

The English-floated mines at Cripple Creek, are Stratton's Independence, Lillie and Caledonia. The Moon-Anchor mine was sold to London; failed under its English control, and has since been purchased by local owners.

All these mines—as is usually the case when we
mining concern—were bought for double, treble, or ten
value. It is wonderful that the English public does not
this sort of thing.

Stratton's Independence.—The his
very typical of the wretched way in w
industry is carried on.

The original report on the mine.

The report on which the mine was floated, which was based on 1,008 samples assayed, stated that the ore in sight would yield a *profit* of $5,312,000, or, say, £1,090,000. This report, furthermore, showed that on the sixth, seventh, and eighth levels the reef was much narrower than in the upper workings; and it also showed that although the ninth level, the lowest in the mine, had been driven into the ore body, it had exposed no payable ore at all.

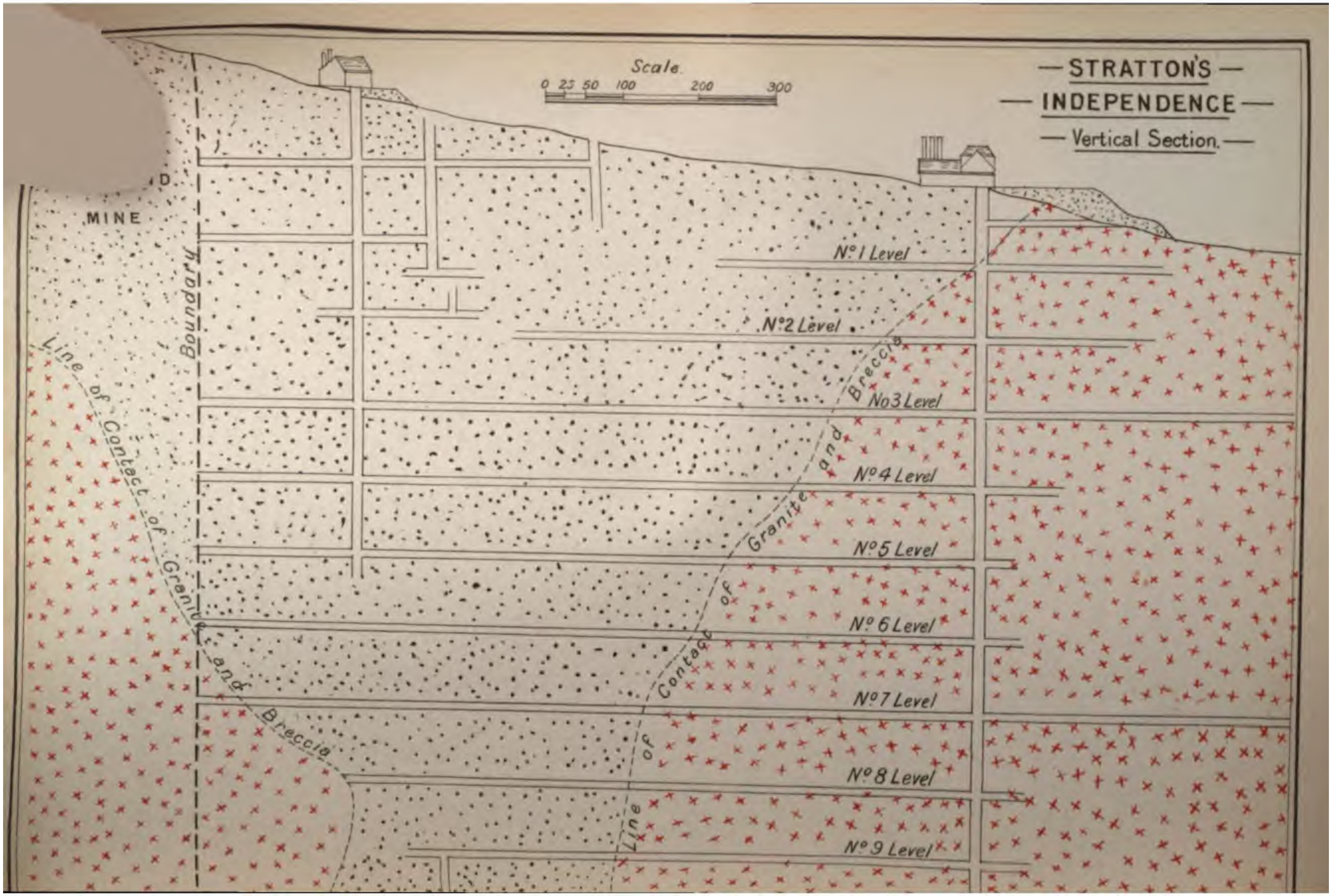
It was to be inferred from the report, that other bodies of payable ore would be found in the upper levels; but this point could not be set off against the poor appearance of the lowest workings—as shown by the report and the maps which accompanied it.

Bought for double the value of profit in sight.

In the face of this, and with only £1,090,000 profit in sight, the Venture Corporation undertook to float the mine, and to pay its owner a sum of over two millions sterling.

The vendor still in control after flotation.

As there were only a million shares in the new company which was formed, it was necessary that the public should come forward and purchase these shares at over £2 each, and at a price which was admittedly double the value of the profit in sight in the mine. With a view, I suppose, of tempting the public to do this, the wretched custom of publishing each day's yield from the mine was started. This is still carried on. The first evil was thus the over-capitalisation of the mine, roughly speaking, at twice the amount of profit in sight. The next evil was that the property was still under the control of the vendor—he not yet having received the cash price for which he had sold the mine. The manager-in-charge was the nominee of the vendor, and I believe that the company's consulting engineer was expected by the vendor to exercise only a nominal control over the mine's affairs. In any case this absurd arrangement led to trouble. The manager, as time went on, greatly over-estimated the tonnage and value of new ore developed, and the consulting engineer, whose difficult position I can quite appreciate, without again sampling the mine himself, endorsed this estimate. A quite incorrect idea of the mine's true value was in this way spread among the shareholders.


— STRATTON'S —
— INDEPENDENCE —
— Vertical Section. —
Scale.
0 25 50 100 200 300
D.
MINE
Boundary
Line of Contact of Granite and Breccia
Line of Contact of Granite and Breccia
No. 1 Level
No. 2 Level
No 3 Level
No. 4 Level
No. 5 Level
No. 6 Level
No. 7 Level
No. 8 Level
No. 9 Level

Exaggeration of ore values.

Time went on, and the vendor received all or most of his money; he then relinquished control of affairs; his mine-manager also left. Then the consulting engineer, having at last a free hand, appointed his own manager, and as a result of an immediate re-sampling of the mine, discovered how inaccurate was the late manager's estimate of the mine's then value. As a matter of fact, since its flotation, the mine has never opened out well in depth; moderately valuable new ore bodies have, however, since then been found in the upper levels. All this might have been expected from the wording of the original report and the plans then published.

Mine is now disappointing in depth.

The reason that the mine is a failure in depth is shown by the accompanying vertical section of the workings. The breccia in which the rich ore lies is squeezed at each end by masses of underlying granite, and when the reefs enter into the granite they lose their value entirely. There is no reason why this should be so. In other mines at Cripple Creek good ore is found in the granite, but in the Independence its appearance is quite fatal to payable ore.

Granite cuts off the pay ore.

As the workings get deeper, the granite closes in more and more, and the total length of breccia at the 970 foot level is only 417 feet. This means that the length of payable ore at that level is also only 417 feet, and as its average width is only just over a foot, the small tonnage of ore in this, the deepest part of the mine, can be easily imagined. It seems almost impossible that the breccia can again widen out at a greater depth; I believe, rather, that it will continue to contract until a mere chimney of it is left—not worth following down. The breccia is a volcanic rock, and it is possible that right here is the vent of a volcano. This of course might narrow down so much that it probably would not pay to follow the reef much below the [illegible] lowest workings.

The future; and value of the shares.

The mine then, as it looks to-da[illegible] not on its lower levels for the future. I [illegible] in sight, or likely to be yet discovered [illegible] three years, beginning from Jan[illegible] of this will not be so great as the ore being treated at the time of my inspection, which was worth $30 a ton. Failing rich discoveries in depth, I suppose that a maximum profit of two hundred thousand pounds may be earned by the mine from January, 1902, to the time the levels now opened are worked out; but it is by no means certain that the actual figure will really be so much as that. Below that the value of the mine is quite problematical, but probably it will be disappointing. The local management is efficient.

Lillie. (Issued capital, 225,000 £1 shares.)

The **Lillie** (Cripple Creek) mine was registered in London in 1898. At the time it was floated there was a moderate amount of good ore in sight, but not enough to justify its excessive capital. The property, too, was only seven acres in extent. The mine was equipped with a good shaft and good machinery. As the deeper levels were opened, it was found that the payable ore chute dipped very rapidly into the Vindicator mine, and at a vertical depth of something like 500 feet the whole of the chute had dipped out of the Lillie property. The shaft was continued on to 1,500 feet, but although the reef held down, no other rich chute was found.

Mine is worked out.

The payable ore in the mine yielded over $360,000 in dividends; but this was a return of barely a third of the capital. I imagine that there is little hope of anything else of value being found. The property is now let on tribute.

Caledonia.

The **Caledonia** (Cripple Creek) mine is shut down. Hardly any work appears to have been done on the property.

San Juan district:

the mines lie far up in the Rocky Mountains.

In the south-west part of Colorado lies the important San Juan mining district. All the mines there are situated high up on the slopes and spurs of the Rocky Mountains. Railways tap the valleys, and from the termini supplies are packed up to the mines by mule trains. In winter this is done over deep snow. Aërial trams usually carry the ore from the mines to reduction plants lying farther down the mountain sides, where the flow of water is greater, and where there is less danger of snowslides than on the steeper brows. All the mines are worked by adits. The

Geology of the district.

geologic formation of this part of the great mountain range is unusual. Up to about 9,000 feet the rock is sedimentary—water laid—consisting of wide layers of red sandstone and conglomerate, which dip at an angle of 15 degrees to the north. Lying directly on the top of this is a layer of plutonic rock, andesitic breccia, about 2,000 feet thick; and above this again, stretching up to the top of the highest peaks, is a rock which geologists describe as almost a lava. The slopes of many of the mountains are covered with *débris* worn away from this highest stratum of rock.

The fissure veins are of great regularity.

In the breccia the best reefs are found. Fissures can be traced for miles running through the mountains, and the quartzose filling of these, especially in the breccia, often yields chutes of valuable ore. Curiously enough, these quartz-filled fissures carry all sorts of metals within a very small area. Some reefs are free milling gold ore. More are of gold, with silver in addition. Most of all there are reefs of silver. Copper also occurs in small quantities, and in many of the reefs there is a good deal of zinc. I saw in the Menona mine a vein of nearly solid mineral carrying gold, silver, lead, zinc, and other metals. A quarter-of-a-mile away is the Argentine reef of the Tomboy mine, carrying a free gold quartz. Still nearer is the Japan mine, of silver lead ore; and a mile further on is the Smuggler Union vein, carrying nearly equal proportions of gold and silver. Over the mountain is the Camp Bird, another free gold ore—and so on. These fissures extend down into the sedimentary rocks, nearly 2,000 feet below these mines, and here and there payable ore deposits have been worked where the reefs outcrop in this formation. It is, however, unlikely that the mines now working profitably high up in the breccia, will extend down to this horizon. The reefs certainly will go down; but they will, I think, have lost their [illegible] contents before reaching that depth.

Variety of contents.

All the mine managers I [illegible] district treated me with great courtesy, [illegible] that it was possible to see in the [illegible]

Camp Bird mine.

About eight miles from Ouray, in the San Juan district, up in the mountains at an altitude of over 11,000 feet, is the **Camp Bird** gold mine. Ouray itself, a small mining town, lying in a basin among the mountains, is shut in by precipices which show immense sections of stratified red conglomerate; but, as you gradually ascend, these water-laid beds are in turn covered with still wider areas of breccia, and in this rock, on the side of a snow-clad peak 14,000 feet high, lies the mine.

Altitude.

The Camp Bird property belongs to a single owner. It is one of the best mines in Colorado, and is known in England because of the negotiations for its purchase and flotation, which so far have not gone through. I believe, however, that the mine will eventually be sold to English buyers, and will briefly state what these negotiations were.

Its value in 1900.

Two leading engineers sampled the mine; one on behalf of the owner, the other for the would-be purchaser; the average of their results were as follows:—

Negotiations for sale

APPROXIMATE FIGURES.

Payable ore in sight - - -	135,000 tons.
Gross value per ton of 2,000 lbs. - -	**$40.**
Net profit on this ore - - -	**$4,500,000**

Ore in sight and its value.

Although there was every reason to think that much more payable ore existed in the mine: firstly, because it was a new—not a worked out—property; secondly, because several faces were still in payable ore; thirdly, because the length of the pay chutes was more than usual, indicating that the depth of these would also probably be considerable: in spite of these points, the strictly scientific method of valuation, of taking account only of ore actually in sight, was adopted.

This method of valuation showed an actual profit already exposed in the mine of, say, $4,500,000. But the owner demanded several million more dollars than this for his property; and as the purchasers were not prepared to take the risk of finding enough ore, over and above that already exposed, to make up the deficiency, there was no sale. As a matter of [illegible]ct the mine was, at that time, not sufficiently developed to be put on the market, and the owner acted wisely in deciding to hold it, and do more development work before again offering it for sale.

But the Camp Bird is a big mine, and if it is bought in the next year or two, while still only a small tonnage has been taken from it, a big price will have to be paid for it. The equipment alone has cost $600,000.

Its discovery.

On this same mountain veins of silver-lead ore are worked, and it was while prospecting for these that the Camp Bird gold-bearing outcrop was found. In most places the outcrop, hidden for the greater part of the year by deep snow, is also covered by a thick layer of *débris*; it is fortunate that it was not necessary to sink shafts through this. Further down the slope two adit tunnels have been put in. In each of these the reef was cut, and driving along it has now been done for a distance of several thousand feet each way.

There is a vertical depth of 300 feet between the two tunnels, and between the upper tunnel level and the surface there is a height varying from 200 to 1,200 feet. It can be seen at once that if the whole of the ore exposed between the lower tunnel level and the surface were payable (its average width being about 5 feet), this would be a mine of extraordinary value. But, as is the way with nearly all mines, most of the ore is not payable, and I judged that even the chutes of payable ore seemed to be getting gradually poorer at the lower level than they are nearer the surface.

Appearance of ore:

in depth.

So, then, we see that even a fine mine like the Camp Bird, which as yet is a new mine with its history before it, has got its limitations. We may, I think, assume that the ore between the two levels—a vertical depth of 300 feet—is not so good as it was above the upper level, and probably this falling in value in depth will continue below the lower level, where, as yet, no work has been done.

The value of the Camp Bird mine I [illegible] mainly centered in the ore *above* the upper [illegible] 1,000, as we have seen, the ore then [illegible] of

$4,500,000. Since then a large amount of this has been taken out, but a still greater quantity has been exposed by new development work, which is still going on.

Probable discoveries on west ore body.

The west end of the mine shows a splendid chute of rich ore, nearly 1,000 feet long. From the level here, to the surface, is 1,200 feet. A raise, in good ore all the way, has been put up 180 feet above the level, but from that point to the surface no work has ever been done. If the reef goes up even half way from the level to the surface, of similar value to what it shows on the level, it will double the value of the mine!

Outside of this possibility, which on exploration may prove to mean so much, I should imagine the profit in sight to be at least as much as it was in 1900. As a matter of fact it is probably more; but to speak at second-hand of any mine's ore value, without actually having sampled the mine yourself, or inspected its assay plan, is never very satisfactory. I can say, without doubt, that the Camp Bird is a big mine; but its precise value, on later developments, will probably not be known until a sale of the property is made.

Equipment of property.

The whole of the mine is worked through the lower tunnel. From here an aërial tram several miles long, and worked by gravity, carries the ore to the mill—a vertical drop of 1,800 feet.

Battery.

Cyanide plant.

Management.

There are 60 stamps of 880 lbs., which crush nearly 200 tons a day. Of the total contents of the ore 75% is caught on the plates; the tailings then pass over frue vanners or wilfley tables—according to fineness—and are finally cyanided. The cyanide treatment extracts over 75% of the 4 dwts. of gold still left in them, at a cost of $·65 a ton. This is first-rate work, but as yet the slimes are not being treated. The concentrates are trained to Pueblo and smelted there. The mine is well handled in all its branches; the equipment being especially good and of a permanent nature. When one remembers that this has been done by a private owner, who is far-sighted enough to look into the future at the sacrifice of immediate profits, the wish may be expressed that his property, when fully developed, will bring him a big price.

Tomboy mine. (Capital, 300,000 £1 shares.)

Over the mountain range from the Camp Bird, about three miles distant, lies the **Tomboy** mine, whose vein crops out at over 12,000 feet above sea-level. In summer this range can be crossed at a height of 13,500 feet; but at the time of my visit—the end of October—the snow was lying too deep to attempt this. I had, therefore, to get to the Tomboy by way of the Denver and Rio Grande to Telluride, and from thence up the mountains on horseback.

The Tomboy reef, lying in the same kind of formation as the Camp Bird, has produced ore for a number of years. Down to 600 feet the mine is worked by adits; below that by a vertical shaft sunk inside the mountain. The levels along the line of reef extend several thousand feet.

'Tomboy' reef gets poor in depth.

But in depth the ore got distinctly poorer. Below the 600 foot or main adit level, the falling off was serious; and the two bottom levels, at 900 and 1,000 feet, have as yet shown no payable ore at all. The inference, in the present state of development on this reef, is that it is nearly worked out. The payable ore now in sight is put at 60,000 tons, and probably 100,000 tons is the maximum amount of payable ore still to be worked on this reef.

So much for the Tomboy reef proper, which, up to the early part of 1901, was the main asset of the company.

Argentine reef.

But in June, 1901, the Tomboy Company began mining a new reef, located on a claim recently purchased, called the Argentine, and taking its name from the claim. This Argentine reef, a well-defined fissure, traceable for a long distance over the mountains, had been worked, off and on, for twenty years, unsuccessfully. But as the Tomboy Company drove along it, continuing one of the early drives, the values suddenly came in, and exposed such a fine reef that the future of the Tomboy, then in doubt, is likely to be assured for years to come.

Ore chutes on this reef.

I must describe this adit drive minutely, as so much depends upon it. For the first 325 feet, driven eighteen years ago by a former owner, the value is poor. A little further in, along ground recently driven by the company, the first ore chute is found. This is 300 feet long, and of payable value. From here to the surface is a distance of nearly 200 feet, but as part of this depth is composed of *débris*, the backs may be taken as 100 feet. The width of reef is 5 feet.

Here, then, is the first ore body on the Argentine reef; 300 feet long, 5 feet wide, and probably 100 feet high. Then there comes a section of the drive which is poor. The next payable ore chute is 408 feet long, 9 feet wide and—making the same allowance for *débris* lying on the surface—about 100 feet high. Then the drive shows another 150 feet of poor ore; but, at the time of my visit the face was again improving, and probably a third pay chute is going to be found. As this drive gets longer the distance between it and the surface increases very rapidly. If another pay chute is found in the drive, after it gets 1,000 feet or so beyond where it now is, there would probably be 1,000 feet of 'backs' between the drive and the surface! If all of this carried payable ore the Tomboy would turn into one of the biggest gold mines in America, and it is this possibility about the result of this drive on the Argentine reef which makes the shares such a tempting speculation.

Ore in sight.

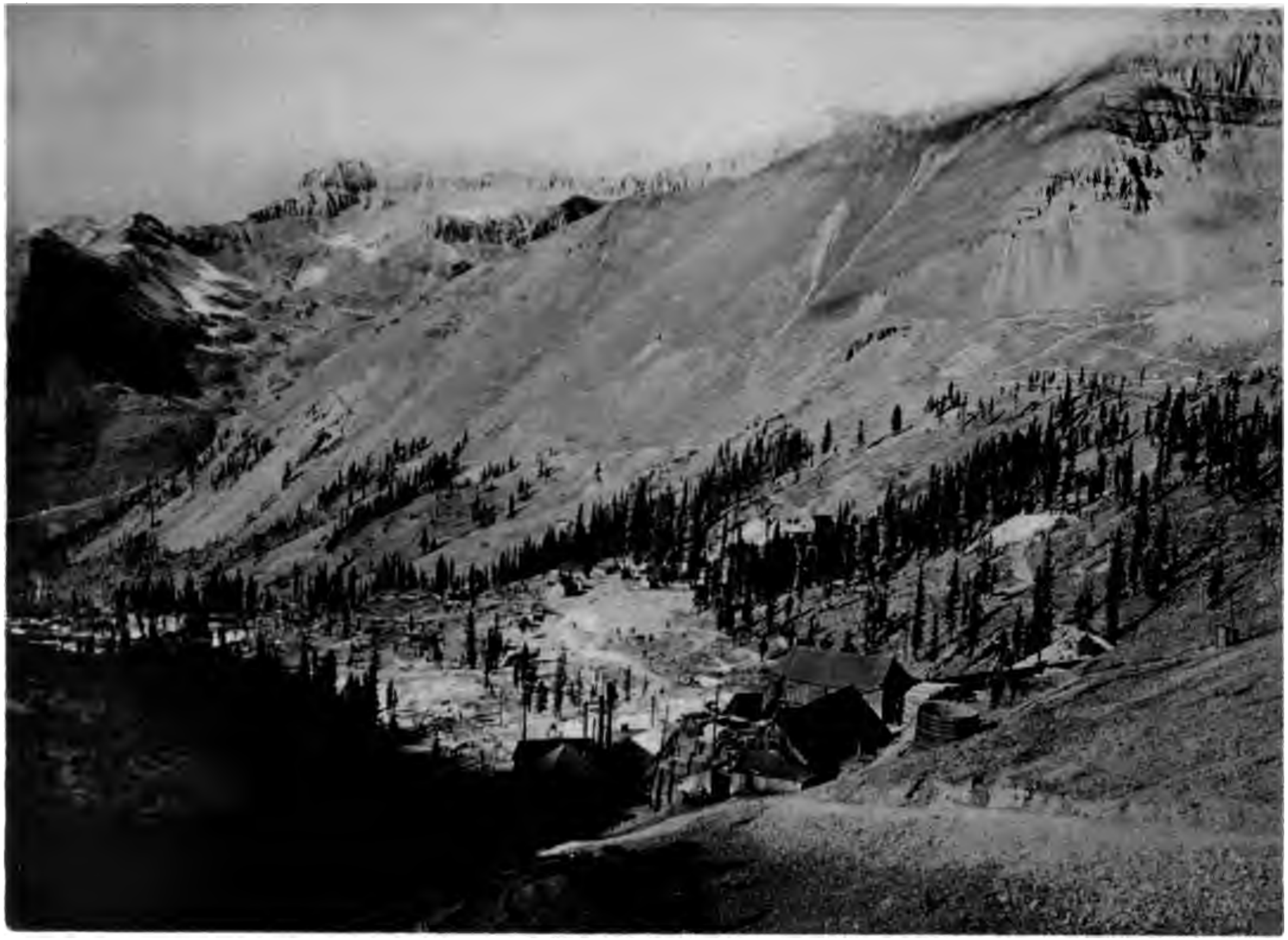
This drive has already exposed two ore chutes, aggregating 700 feet in length and 7 feet in width, and at any time another chute may be met with. This ore averages probably $20 to the ton.

Another adit, 130 feet below this, is now being driven. If these chutes are found in this lower adit, of equal size and value to that described, the mine will be assured of big profits for some years, and the shares will probably go over £3. This is exclusive of any new ore chute that may be discovered in the upper level; a discovery here, with 'backs' of 500 or 1,000 feet above the level, would add a big intrinsic value to the Tomboy shares.

Value of the shares.

Surface equipment.

The surface equipment of the mine is only moderately good. [illegible] the mouth of the Tomboy adit tunnel there is a



TOMBOY MINE COLORADO 12,000 FEET ABOVE SEA LEVEL.

reduction plant of Huntingdon Mills. The tailings are then passed over frue vanners, and, being heavy in copper and zinc, and poor in gold, are allowed to run to waste. To treat the Argentine ore, in the meantime, a small battery belonging to a neighbouring mine is used. If the Argentine turns out well a new stamp mill, of heavy pattern, of either 60 or 100 stamps, will be put up, and the present machinery discarded. Electric power is used for hauling, pumping, and lighting.

Mine plans.

The mine plans of the company are among the best I have seen, and might be used as a model by many managers I could mention. On the whole, this mine is at present one of the most fascinating problems I know of, and the balance of probability is that by the end of 1902 it will really be in a fine position. A short distance from the Tomboy mine, and working several of these fissure veins that can be traced for miles cropping out on the mountains, is the **Smuggler Union.** This is a notable mine, and has been worked for more than twenty years. At first it was worked as a silver mine, and was very rich ; but in depth the ore became low-grade, and now carries more value in gold than in silver.

Smuggler Union. (Capital, 50,000 $100 shares.)

The mine is worked by adit levels, and owing to the wonderful persistence of the reef, some of these levels are driven a great distance into the mountain. Several of the stopes are over a mile long !

Stopes a mile long.

Not only is the Smuggler vein—the most valuable of those worked by the company—payable for a great length, but in depth it is equally persistent. In the lowest adit level now being put in—when this level gets under the highest part of the mountain—it will be over 2,500 feet to the surface, and the whole of this is payable ore ! The average width appears to be about 4 feet, and there are now many hundred thousands of tons exposed.

Ore reserves.

If this Smuggler Union mine contained ore of moderately high value, it would be quite a remarkable property ; but the low grade of the ore tells against it. The recovery per ton in gold and silver is between $6 and $7. But against this must be set a developed mine with enormous ore reserves, and the possibility of handling a big tonnage.

Equipment.

The surface equipment consists of three mills, with 155 stamps altogether, concentrating tables, cyanide plant, and a canvas plant for concentrating the slimes. The ore is brought down the mountain to the mills by several aërial trams. Part of the plant is driven by electricity, generated by water power, the rest by steam.

Monthly tonnage and profit.

The plant having been increased lately, the future monthly output is placed at 16,000 tons. The mine is so large that it could handle a greater tonnage than this, but I believe there is a limit to the water supply. Working costs are stated to be under $5 a ton, all told, and with a recovery of $6—$7, a monthly profit of between $15,000 and $25,000 should be earned. Of course a slight falling off in the value of the ore would be a serious thing, but there is so much ore in sight, and it seems to be so regular in value, that the manager is confident of doing well. Between the Smuggler Union and the Tomboy is the **Menona** Company's mine. The lode is a heavy mineralised one, occurring in streaks in the fissure; and besides a principal value of gold, carries also silver, lead and zinc. A rich concentrate is made, but its value in lead is offset by an excess of zinc, which the smelter penalises when forming over 10% of the total bulk.

Menona mine.

Value of the ore.

The reef, with only very narrow stringers of this rich mineral ore occurring in it, struck me as being unlikely to yield a substantial profit. There is a chance that other reefs may be discovered on the property.

In this same district is the **Liberty Bell** gold mine, which I did not see.

South Dakota.

In South Dakota gold-mining is confined to the Black Hills district, which was first opened in 1876; the rest of the State seems to be all a rolling prairie, more suited to wheat-growing or horse-breeding than mining.

The Black Hills.

The mining centre in the hills is Deadwood. Three miles away is Lead City, which has grown up round the great Homestake gold mine.

Low-grade deposits.

It is customary to say that, outside of the Homestake, there are no payable mines in the Black Hills, and no other ore deposits worth mentioning. But this is quite wrong. There *are* other payable mines in the district, and deposits of gold ore—a number of which I saw. These deposits are low-grade, and have never had the big working capitals applied to their development that only can make low-grade ore profitable. But I venture to say that within the next five years there is going to be a change. American mining men will realise the value of this district. It will be re-prospected; capital will be put into it; the low-grade deposits will be treated on a big scale, and by the latest methods of economic mining; and some payable and perhaps big mines will certainly be found.

Scarcity of water.

Trans-portation of ore to water.

A drawback is the scarcity of water. The Homestake has got all that there is for miles round the mine, and has, in addition, spent a million dollars on bringing in a supply from a distance. If other mines start, they will not have enough water to crush the ore at the mine, and will have to send it by rail to suitable spots nearer the plains, where mills can be erected. Two railway lines already run branches to the Homestake and other neighbouring mines, so that this question of transporting the ore to water can be overcome.

Success of cyanide process.

A great factor in the opening up of the Black Hills mines is the success of the cyanide process on the low-grade ores. Tailings now produced, even if worth less than $2 a ton, can be treated by cyanide at a profit, and the costly chlorination process hitherto in use can be done away with. This has been shown by the 1,200-tons-a-day cyanide plant lately put up at the Homestake, and by several small plants now at work in other parts of the Black Hills district.

Profits on low-grade ore.

On these lines—the providing of an ample working capital; the development of a big low-grade deposit to produce a thousand tons a day; the carrying this at a low freight, by rail, to a spc .ere water for milling can be had; milling for free gold; and, finally, the treatment of the tailings by cyanide, in a pl the latest design—on these lines, I predict the Black Hills ict is going to make great strides in the near future. I am sure that there are big deposits of easily treatable ore there that will yield $4 a ton; and at the figure to which local working costs have been reduced, this will yield a profit. The Black Hills district has certainly a future.

The omestake:

mpared with other big mines.

The Homes e pany is the biggest gold mine in the world. I u big advisedly. The Simmer and Jack, the the Transvaal, will have 320 stamps after the wa ka Treadwell has 540 stamps. The Homestake has 90 C world's principal gold mines. Mount Morgan is the greatest, the Treadwell is the lowest grade, and is the most cheaply orked; Golden Horseshoe is the highest grade; and the Ho stake the biggest.

Capital.

The capital is 210,000 shares of $100 each. These stand now at about par, so that the market value of the mine is $21,000,000. A lady is said to hold half of this!

Open at workings.

The present Homestake Company is an amalgamation of half-a-dozen smaller mines working along the line of the deposit. Each of these mines originally worked the lode by an open cut, so that a series of these great quarries now exists—nearly two miles in length—on the Homestake property. These quarries still furnish a certain amount of ore, but the bulk of the ore is coming more and more from the deeper workings, which are reached by shafts in the ordinary way.

Depth of shafts and ore in sight.

The ore may be described as a quartzified schist, bedded in the formation, and varying—at least in the open cuts—from 50 to 400 feet wide. It has been proved to continue in depth as far as any of the shafts have been sunk; the deepest of these is now 1,100 feet; and probably between this point and the surface there is ore in sight to last for 15 or 20 years. I believe the pitch of this great ore body is to the south; and at a certain depth it will pass out of the Homestake property altogether. But in the meantime there are such vast quantities of ore in sight, and so much ground at the south end of the mine yet undeveloped, that this point can be said to affect only very remotely the future of the mine.

Stamp mills.

Tonnage treated.

Monthly output.

The 900 stamps now at work are in six batteries placed at different points along the line of lode. Each stamp weighs about 900 lbs., and crushes rather over four tons a day, so that the present amount of ore being crushed is about 1,200,000 tons a year! This ore will give an average yield from mill and cyanide of nearly $4 a ton, so that the monthly output of the Homestake is now probably 18,000 ozs. of fine gold.

Working costs.

Account lacking in system.

Working costs, all told, are rather over $2·50 a ton—leaving nearly $1·50 a ton profit. I cannot give the exact figures, because the company's reports do not show them, and the management will not tell what they are. In the 1901 report—a ridiculously meagre production I call it—the difference between the receipts and disbursements showed a theoretical profit of only a few cents per ton. But I learned that over a million dollars of the disbursements had been on account of new plant and machinery—which amount, in an ordinary year, would have been shown as profit. The system of only one account for a mining company—*i.e.*, receipts and payments—is a system I want to see introduced in England. Our mining balance sheets, capital accounts, etc., are simply used to cook figures, and, when necessary, mislead shareholders as to the company's true position; but the finance statement of the Homestake Company goes to the other extreme. Its items of expenditure are set out in alphabetical order instead of under the several heads—such as mining, milling, mine development, machinery and plant, etc.—they are not summarised at all, and leave a very vague impression indeed.

Cyanide plant described.

The recently built cyanide plant of the Homestake is the largest and the finest in the world. The product from 540 stamps is sized down by cones and jigs to one-half—*i.e.*, 1,200 tons a day, and here treated. In this process the sand is concentrated up to a value of $1·50 a ton, and is freed from all slime. The vats hold 600 tons; they are filled direct; emptied by sluicing; and the treatment takes seven days.

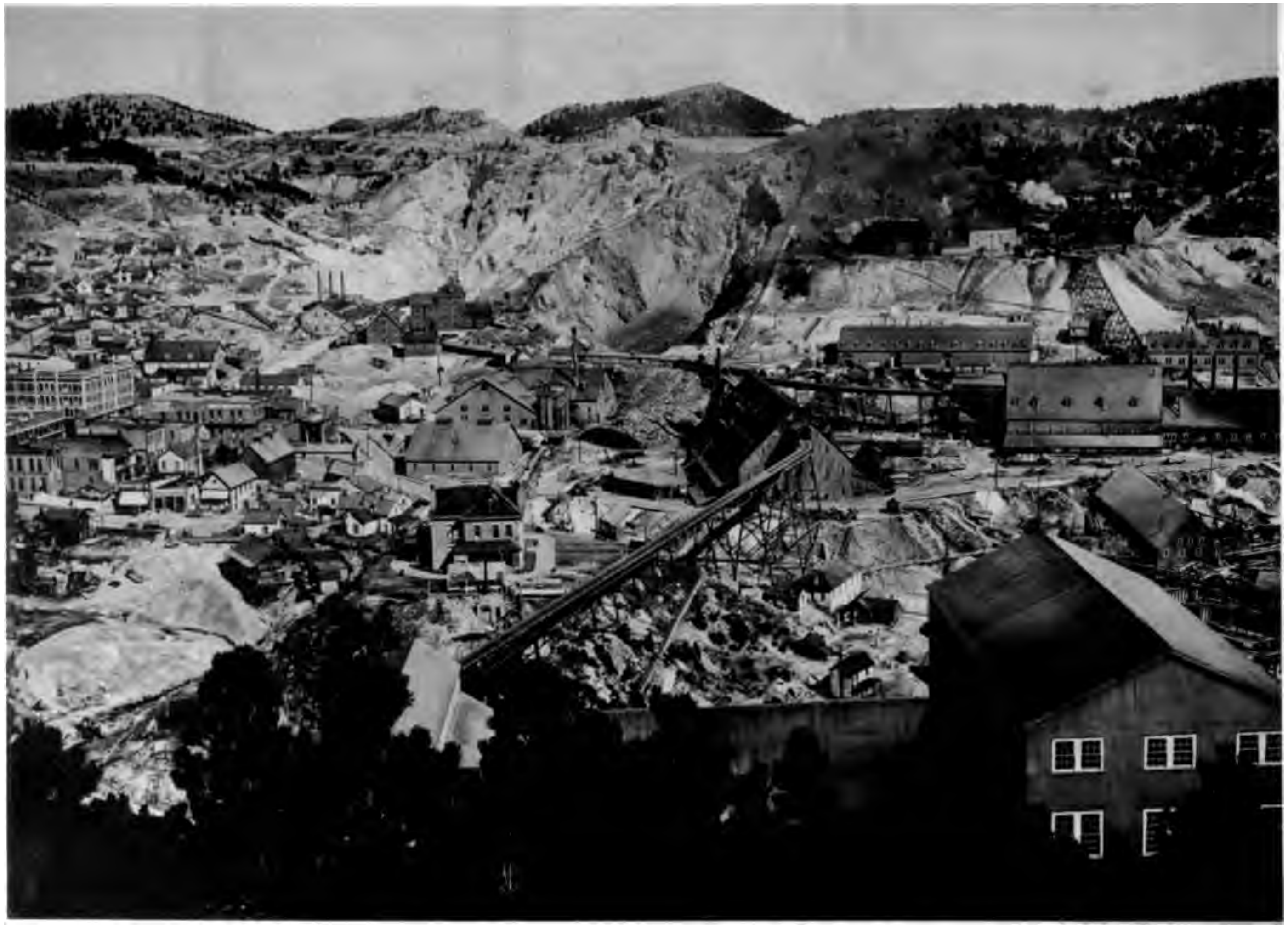
The extraction is about 70 %, *i.e.*, just over a dollar a ton, and the cost probably less than 50 cents a ton. The extraction is greatly increased by the pumping of compressed air into the sand from below after each solution has been drawn off. This supplying of oxygen I take to be the great feature of this plant, and also a notable step forward in the cyanide process. Another plant, to treat the tailings from the other mills, is now to be built. The next question will be how to save the gold in the unconcentrated tailings and slimes. When one learns that these are worth barely $1·25 a ton, and that their profitable treatment is seriously considered, we realise how greatly the cyanide process is going to increase the yield from low-grade gold ores.

ummary of ie mine.

There is no need to describe at length the stamp mills, or the general equipment of the Homestake. All is of the best. At the company's foundry, castings are made of all things required on the mine—even the mortar boxes; and everything I saw (shafts, engines, machine shops, boilers, all the details of management) left a favourable impression on me. For 22 years the mine has never missed paying a monthly dividend. The total sums paid by the amalgamated companies is over $15,000,000. The present dividend is $1,260,000 a year—6% on par value. From what I saw of this great mine I believe the shares, although yielding only this rate of interest, are a moderately good investment.

Iidden Treasure nine.

I inspected a series of immense gold-bearing formations running parallel with the Homestake lode, and at no great distance from it. Most of these I take to be too low grade to work. The **Hidden Treasure** Co. owns sections of these lodes, one at least of which is said to have a recovery value of $4 to $5 a ton. I suppose this ore to be treatable by mill and cyanide, in which case it ought to be worked at a profit. The company is putting a fine tunnel into the hill where these formations crop out, and will cross-cut into them in depth. If the ore is payable, it will be carried 27 miles to a spot where there is water, and there crushed.



THE HOMESTAKE GOLD MINE, SOUTH DAKOTA.

A railway passes the mouth of the tunnel, so that transportation can be easily effected.

Golden Reward mine.

Nature of the reef.

Quantities of low grade ore.

Three miles further on is the **Golden Reward,** a mine owned largely in New York, which has been a big producer for some time now. This struck me as a notable mine, and one likely to have a big future. The reef now being worked is a contact vein, lying almost flat, and making between quartzite and phonolite. Its formation (though not its structure) reminded me very much of the flat reefs at Lydenburg, in the Transvaal, worked by the old Morgenson and Lisbon-Berlyn mines. This flat reef is of high value, running probably $15 a ton; averages 4 feet high, and has been opened up for a great distance. The ore has been sent by railway to Deadwood and there smelted; in future it will probably be treated by cyanide. But the manager of the mine showed me something that interested me even more than this flat reef. The rock covering the reef is volcanic—phonolite. Recently this has been cross cut into and opened up at several points. It is hundreds of feet thick, overlies the country all round, and is definitely stated to average—over big areas—$5 a ton. This is the witching figure in the Black Hills. It is a free milling ore amenable to cyanide, and I see no reason therefore why the Golden Reward should not become as big a mine as the Homestake. The ore must be carried by a train down to a mill site where there is water; but beyond this expenses should be normal. The quantity in sight is figured at many million tons.

Two or three problems like this—assuming the figures given me to be correct—would draw attention to the Black Hills from all over the mining world.

Montana Mining Company.
(657,128 £1 shares, 10s. paid.)

In Montana the only gold-mining camp I visited was Marysville, where I saw the property of the **Montana Mining Co.** This has been worked for nearly 20 years, producing about 1,000,000 tons, and has been a notable mine. The workings are 1,600 feet deep. Below about 1,000 feet hardly any payable ore was found; but the company pluckily developed the reefs for another 600 feet in depth, and did miles of driving and cross-cutting that yielded no return at all.

Mine is worked out.

In 1901 it was decided to sink no deeper, so the pump was taken up and all work centered on the upper levels. Here there are some pillars of ore still standing, and blocks of low-grade rock which the earlier managers left behind. This ore will probably be worked out by the end of 1902, and so far as can now be seen the mine will then be finished.

Tailings treatment.

Cash on hand and future prospects.

Five years ago a start was made to treat by cyanide the large accumulation of tailings. From these an extraction of about $2·70 a ton has been made, being between 60 and 70% of their contents. The sands are being treated at the rate of 100,000 tons a year, and will probably last out for another year. After that there will remain about 150,000 tons slimes. These average about $2 a ton in gold and 50 cents in silver, which I imagine in their acid condition to be an unpayable value. The tailings treatment, including conveyance from the dam some miles distant, averages about $1·50, including 30 cents a ton for depreciation of plant. As they are acid and not free from slime, I consider this good work. The company has cash and liquid assets, of apparently about £70,000, which should be increased somewhat by the time the mine is worked out, and the tailings all treated. With a substantial sum such as this in hand, and an excellent staff ready to transfer itself, I do not see why a payable mine somewhere else should not be happened upon. In fact, I believe such a mine has already been located in Nevada and the company will transfer itself there before long.

Empire mine.

Near Marysville is the **Empire** mine, a shut down property, which is being developed again. There is a big quartz reef here, cutting as a clean fissure through the flat-lying formation. No doubt a good tonnage of ore exists, but it seemed to me of very low grade. It is to be treated by dry crushing through rolls, and direct cyaniding.

In the meantime, the cyanide plant is being started on an accumulation of tailings from the mine's earlier days.

Bald Butte.

In this district is the **Bald Butte,** which pays regular dividends. I was not allowed to inspect this mine.

Utah:

In the State of Utah nearly one-half of the gold yield comes from the Consolidated Mercur mine. Of the balance most is turned out as a minor product, by copper and silver-lead properties. For example, the Utah Consolidated Gold Mines—which by the way is not a gold—but a copper mine—yields about $2 a ton in gold, as also do other copper mines in the Bingham district; the silver-lead ores of Tintic also, yield greater or less quantities of gold.

its gold output from various sources.

Here and there gold-mining prospects are being developed, and in the southern parts of the State they give some promise of turning out well. One mine indeed, the **Annie Laurie,** in the south of Utah, has lately started to turn out quite a lot of gold. I did not see this mine, but was told by the directors in Salt Lake City that its present yield is $40,000 a month, and that there is ore in sight for several years.

Annie Laurie mine.

Consolidated Mercur.

The Consolidated Mercur, about 50 miles from Salt Lake, is quite a notable mine; it is a consolidation of two mines working adjoining ground, and in its present and original forms has paid over $3,000,000 in dividends. The gross output of gold is now about $120,000 a month. The ore consists of several rather flat beds of great thickness, supposed to be formed of an altered limestone, and lying as a sort of capping over a biggish area. To a certain depth this rock is oxidised, and easily treatable, but below that the rock is sulphide, and often base. In this latter condition it is almost black, but small vermilion patches—caused by arsenical sulphides—are seen when it is newly broken. Mercury is also present in small quantities.

Nature of the ore.

Great thickness of reefs.

These flat ore bodies are three in number, lying perhaps 50 feet from one another. The two upper bodies are worked, but the lowest ore, which contains more silver and less gold, is unpayable. The two upper beds aggregate—at least I should think so from the stopes I saw—30 feet thick. Of course, if the whole area of these beds, covering many acres as it does, and of this width, were to carry payable gold, the tonnage to be treated would be fabulous. But, as in other kinds of reefs, the payable ore runs in chutes, and these chutes at Mercur only embrace a relatively small portion of the whole area.

Ore in sight.

Still, it is a mine of big figures. An exhaustive report, prepared after the recent consolidation took place, showed ore in sight of over 1,100,000 tons, and though it is being mined at the rate of 800 tons a day, an equal amount is being exposed by development.

Sulphide ore and reduced profits.

The oxidised ore is, of course, gradually getting worked out. As the sulphide and base ore cannot be worked so cheaply as the oxidised, and, moreover, as the mine is a low-grade one, and even now does not give a great margin of profit per ton, many people are speculating as to the future. At present, they argue, ton for ton of oxidised and base ore is being treated; the profit is only a dollar-and-a-half a ton; what will it be when *only* base ore is treated?

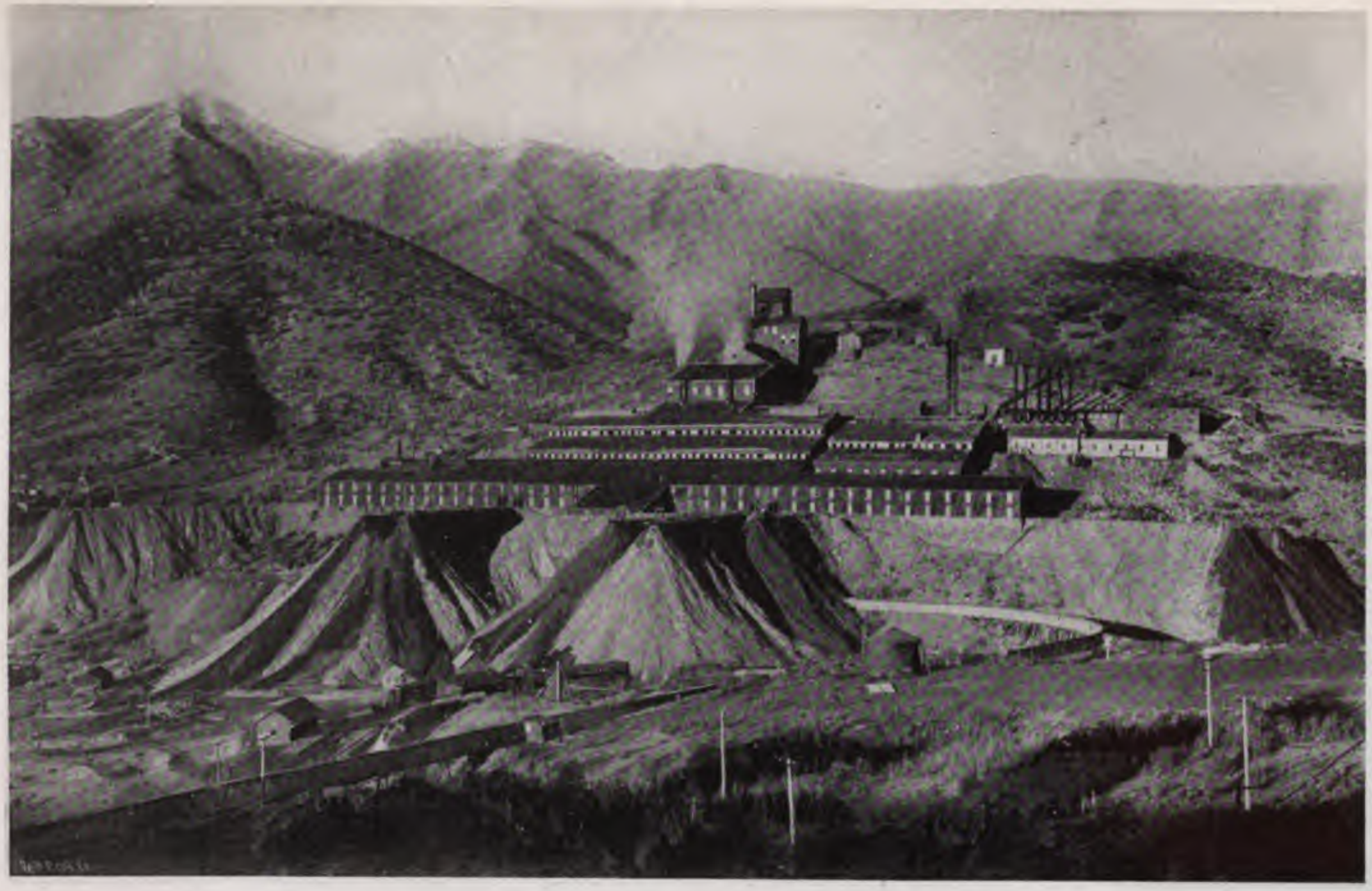
I agree with this argument to a certain point. The profit as time goes on must, I think, come down, and the present dividend of $500,000 a year be reduced. But, on the other hand, I see years and years of work ahead on base ore, and all the development points in the mine still appear to be looking well.

Ore values.

I should think for a long time to come a yield of at least $4·25 a ton can be recovered, and even on base ore the cost should not be over $3·50.

Mine well worked.

The mine is worked well. It is worked on the caving system, like the Michigan iron deposits; this on a big low-grade body of ore, where timbering would be too expensive, is quite effective. It is the only gold mine, I think, thus worked. Of the underground miners, the majority are Mormons. The mine manager told me they are the best workers he has. The metallurgical treatment of the ore, too, is unique. Being so refractory—that is to say the sulphide and base ore—it has to be thoroughly roasted; after that it is crushed by rolls—but only to one-eighth of an inch mesh—and then cyanided direct. This coarse crushing is quite a novelty, and is suited to the ore. The cyanide



CONSOLIDATED MERCUR DRY CRUSHING AND CYANIDE PLANT, MERCUR, UTAH.

solution is found to percolate the solid pieces and a total extraction of about 85% is made. The average value of the ore may be called $5·50–$6·00, and the tailings after treatment assay about $1·00. On the oxidised ore the result is somewhat better than this, and it does not need roasting.

Treatment described.

This treatment of Mercur ore—breaking, rolling, roasting, cooling and cyaniding—on a scale of 25,000 tons a month, is carried out in an immense mill whose construction is a fine example of metallurgical skill. The cost of roasting—necessarily high—is much the heaviest item, but everything else is reduced to the lowest possible figure. All the work is done by machinery; man's labour is dispensed with as far as possible.

Capital and value of the shares.

The capital of the company is 1,000,000 shares, of a nominal value of $5. These are now standing at $1·50. Taking into account the company's cash in hand, its fine plant, the profit it is making on the re-treatment of a great dump of old tailings, and adding to these the mine itself with over a million tons developed—I feel sure that the shares are worth more than this. The present dividend is 50 cents a share a year—showing a present yield of over 30%. But assuming that the dividend will be reduced somewhat, I would even then consider Mercur shares worth more than the present price.

Other mines in Mercur district. The Sacramento.

There are several other mines working on the fringes of these limestone beds. One of these, the **Sacramento**, pays small dividends. It is said this mine could be worked to advantage on a bigger scale. Several consolidations of these smaller mines are being talked of.

California its gold yield to date.

California is now second to Colorado as a gold-producing State, but since the first discoveries in 1849 it has yielded more gold than any other country in the world. The total, to the end of 1901, is about £280,000,000. Next to this comes Victoria, with about £263,000,000. All other countries are far behind these totals.

Individual mines.

There are no big go[illegible] at the present time. Probably no ind[illegible],000 ozs. fine a month, but a num[illegible]

There is gold-mining, of a sort, nearly all over the State, but outside of one or two main districts it does not count for much. Here and there an outside mine is doing well; but the value of such mines, and their signs of permanence, are much exaggerated locally.

The 'Mother lode' belt:

The 'Mother lode' is the real backbone of the California gold-mining industry—just as much so to-day as it was 30 or 40 years ago. This is an immense fissuring of the country, running continuously for a great distance, and carrying within its zone an almost incalculable quantity of quartz. The length of this great belt is over 100 miles. It commences, in the south, in Mariposa, and can easily be traced continuously through Tuolumne, Calaveras, Amador, and El Dorado counties. It then dies out again.

its length,

its width,

In places this belt is probably 20 miles wide. Other parallel lines of quartz are found across this area, but these do not run continuously. The main fissure — the 'Mother lode' proper—runs through the belt from end to end, and seems to have a width of several hundred feet. This formation is composed of tilted schists and shales, with an occasional band of igneous rock, and everywhere big veins of white quartz. These white quartz outcrops can be traced along the belt from end to end. The general dip of this formation is 70–80°. Some of the quartz bands appear to conform to the dip, others again look to be dipping at a flatter angle. The Mother lode has been worked for 50 years. One mine I visited, the Keystone, has been worked for that time without a break. Many others now at work were started as long ago as this, but have not been worked continuously. The deepest shaft of the lode, that of the Kennedy mine, is about 2,500 feet. This does not compare at all with Bendigo, another old field, where there are half-a-dozen shafts below 3,000 feet, but the mining conditions of the two fields are not alike. In the earlier days a number of the Mother lode mines were extraordinarily profitable. Probably 25 or 30 of them yielded gold worth from one million to thirteen million dollars, and a profit

its nature:

has been worked for 50 years.

Early results from [illegible]

varying from several hundred thousand dollars up to five or six millions.

The amount of quartz in the Mother lode, as has already been said, is too great to be estimated. The bulk of it carries no gold, or only a fractional quantity. There are many millions of tons that carry from $1 to $3, and, relatively, a good deal that will average from $3 to $5. Ore worth $5 on the Mother lode to-day is high grade. But in the old days many patches were found—such as have long been exhausted now—of really rich ore. It was from these patches that the big profits were made. Needless to say, this rich ore was generally near the surface, and it got poorer as it was worked deeper. I believe that all the best ore came to an end long before 1,000 feet was reached.

Value of ore now being worked.

Californians may deny this. They will point out that a mine here and there got a lot of good ore below 1,000 feet; that rich pockets are always being found, even now; and that only last year, in the Kennedy, at 2,300 feet, the deepest stope on the lode, such a pocket was discovered.

Is the Mother lode now being worked at a profit?

I can only reply that I inspected 15 mines on the lode, and came away with the impression that they were mostly working from hand to mouth. The ore now worked—after all these earlier years when the best ore was taken out—is excessively low grade, and I believe that, on the whole, the Mother lode is being worked to-day—if taken from end to end—at no profit.

The ore bodies described -

The ore bodies in this great fissure are not continuous. I believe them to be lenses. Such a chute of ore may be 200, 500, or 1,000 feet long. This will then die out, to be replaced further on by another ore body. In depth these lenses seem to be more persistent. For example, a lens 200 feet long might last down for 1,000 feet, or one 500 feet long might go down for 1,800 feet. These would then give out in depth, but sufficient exploration might then discover another ore body which had not existed near the surface. It seems quite safe to assume that the ore goes down to greater depths

Their continuance in depth:

than any shaft will be able to follow it. In the Kennedy mine, at 2,300 feet, I saw a quartz reef 75 feet wide! This is the deepest level that has ever been opened on the Mother lode.

their gold contents.

But as to their gold contents, there is no such certainty. As I have said, nearly all the mines are now reduced to working such a low grade of ore that they make hardly any profit. Most of the ore treated on the Mother lode to-day yields less than $3 a ton!

I will assume that the ore in the bottom of all the mines is *not* getting poorer than the present average, and that there are many millions of tons in sight that will yield, say, from $2 to $3·50—but is this going to be worked at a real profit? The big stope in the bottom of the Kennedy mine, for example, shows hundreds of thousands of tons of ore; but if this were milled in bulk, in the present 40 stamp mill, it would only yield a little over $2 a ton—and at a loss. Sections of this will yield over $3, but by picking the ore in this way the tonnage is greatly reduced.

Yields and costs of individual mines.

The following figures will show the yields of some of the principal mines in the lode:—

Name of Mine.	Period.	No of Stamps.	Tonnage Treated.	Yield per Ton.	Total Costs, exclusive of Depreciation.
Gwin	Year ending March, 1901	80	99,211	$4·38	$2·65
Oneida	Oct., Nov., 1901	60	19,376	2·46	2·24
Utica	Year 1900	160	300,000	2·65	2·11
Jumper	,, ,,	60	48,000	7·62	4·21

To these may be added the Kennedy, with a yield of a little over $3; the Keystone, about $3; and such mines as the Eagle-Shawmut, App, Crystalline, and Harvard with perhaps rather less than $3. But in all these mines, even to bring the return up to $3, the ore has to be picked; if they mined it in bulk, it would yield not more than $2, and, of course, be unprofitable.

Average yield is not more than $3 a ton.

It may be accepted as a correct estimate then, that the average return from Mother lode ore now being mined is barely $3 a ton. It will be noted from the above table that the Jumper mine (a Glasgow company) yields a much higher return than this. The ore body here is not the white quartz, but a band of black slate lying on the footwall of the formation. It is the richest mine now being worked on the main belt of the lode, but this rich ore is coming from stopes averaging not deeper than 400 feet.

How can the mines pay at this figure?

Here is a big group of mines working at considerable depths; handling a soft formation which requires heavy timbering; hauling the ore to the surface, milling it, concentrating it, and treating the concentrates by chlorination; keeping their plants in repair, and sinking deeper every year—and the average yield of the ore they mill is only $3—say 12/6 a ton!

No wonder there is no profit on this ore. The only surprise is that there is not a heavy loss. But it is because of the rare mining facilities of this belt that the thing is possible.

Mining facilities on the Mother lode.

The mining advantages of the Mother lode are these:—

Big ore bodies, which rarely give out in depth.

A free milling ore, which after milling can be readily concentrated.

The best mining machinery, manufactured locally, and sufficient capital to have this erected from the start.

Direct water power, or electric power generated from water power; this can also be supplemented by oil fuel.

Local timber, which will furnish the immense props required to [illegible] ound.

[illegible] ere living and supplies are

[illegible] et untainted with

[illegible]

A local mining university, which supplies highly-trained officials to all the mines.

Mining drawbacks.

The drawbacks are:—

A very low-grade ore.

A soft formation, which requires expensive timbering.

Ore bodies: size and value.

The ore bodies are rarely as small as 3 feet; oftener they run from 8 or 10 to 20 or 30 feet; sometimes they will open out to 100 feet. Much of this ore is worth less than $2, in which case it is left behind. In most of the mines all ore over $2 is taken out, as, including the richer patches, the average would be brought up to a recovery of about $3. The stopes are always carefully sampled and assayed from day to day.

Crushing.

The ore is crushed by stamps of a usual weight of about 1,000 lbs. Amalgamating in the mortar boxes is rare; instead, a copper plate of extra length is used.

Concentrating.

The tailings are concentrated on frue vanners, or tables of a similar make. Two tables to five stamps is about the usual proportion, but where three are used, there is a better extraction. The tailings probably average 40 cents a ton after passing the tables.

The concentrates run about 5%; their value when clean averages over $50 a ton. The treatment is by chlorination. Some of the mines have their own plants, where the cost of treating a ton of concentrates is about $8. When they are sent by rail to a public works the cost is nearly double this.

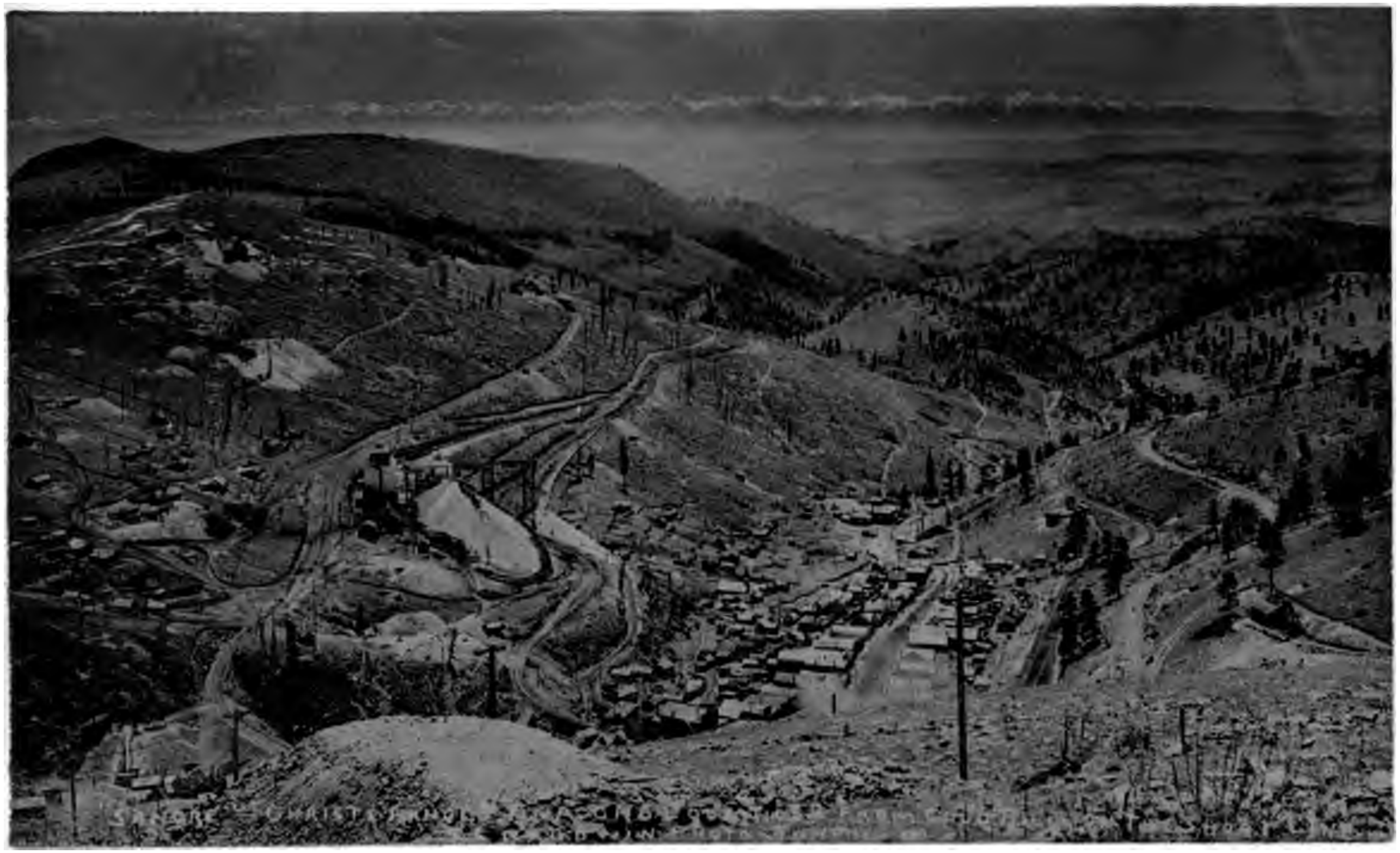
Mining machinery.

The machinery used on all the mines is good, and well adapted to the work. As regards machinery equipment, and shaft-sinking and development, the mines are well financed, and well handled.

They often are failures—but it is because the ore is poor, not because they are badly managed.

Water and electric power.

The Mother lode runs through the foothills of the Sierras. On the higher slopes water is abundant. Power is generated up here by a number of electric companies, and these supply



Baldwin, photo.

A PART OF THE CRIPPLE CREEK GOLDFIELD.

the mines at prices varying from $5–6·50 per h.p. per month. The same companies own ditches many miles in length, which bring water in for the batteries, etc.

Oil power.

Most of the mines do all their work with electricity—milling, hauling, pumping, sawing—but in cases the hauling, or hoisting, as they call it in America, is done with steam. For this oil is used as fuel; it is California oil and compares favourably with electricity at, say, $6·50 per h.p.

The Utica mine has its own water supply, and uses water power direct for everything. Its hoisting engine, on the Stickle shaft, is one of the finest there is. In this shaft a skip is used for baling water; which holds 1,500 gallons.

Mine timber and methods of timbering.

The forests of California, which lie not far from the Mother lode, supply most of the mine timber used; but some, also, comes from Oregon. In the square sets used for propping the stopes, it is quite usual to put in 16-inch timber! This is a tremendous size, but the ground is generally so soft that there is no alternative. Even then the stope has to be at once filled with waste, which is got by putting cross-cuts into the walls.

A treacherous country to stope.

After stoping has gone on for some time in a mine here, the whole formation gradually begins to settle. Not only are the timbers in the stopes crushed and twisted, but those in the drives are equally affected. I saw in drives in the Oneida mine 16-inch props—only put in a fortnight—cracked in two and worthless: the timber-men were at work putting in others alongside of them.

Timbering the biggest item in costs.

This item of timbering, and of repairing ground already timbered, is the heaviest in the cost sheet of Mother lode mines. Were it not for this drawback of soft and treacherous ground the mining conditions would be nearly perfect. I suppose that on a total cost of, say, $2·50 a ton the purchase, haulage, cutting, framing and renewing of timber, runs away with 75 cents—nearly a third. If it were not that this immense timber grows close at hand—if, for example, the mines were where Broken Hill is, or the Rand—it would not be possible to work the Mother lode ore without a big loss.

Climate.
Railways.

The climate is good. The district is served by railways, which, however, do not come right into the mining belt, and supplies are moderately cheap. Labour is of a high standard, and the unions have not a strong-enough grip to make their disturbing influence felt.

Labour.

Finally, there is to be had in San Francisco about the best scientific and practical mining education in the world. The men who are being turned out from here usually begin their careers on the Mother lode mines. With this groundwork, and with the practical knowledge they then gain of such special branches of mining as the use of big timbers, close concentration, electric and water powers—and, more than all, the treatment of low grade ore, where economy is essential—it is not to be wondered at that these men soon become ***absolutely proficient.***

Management.

The Californian mining engineer.

And so we find the young Californian engineer, or mine manager, going to-day to take up well-paid mining positions in Australia and South Africa, and the young Englishman, who has as high a character, and as good brains—but a bad training—wonders why he is being passed over.

The mines—

Dealing with these mines individually there is not much to be said.

Utica.

The **Utica,** with 160 stamps, crushes 300,000 tons a year. This is a privately-owned mine. On a yield of about $2·60 a ton, there is a profit of about 50 cents, from which must be deducted depreciation. There is ore in sight for some years ahead.

Kennedy.

Kennedy.—The deepest mine in California; stoping is now going on at the 2,300 foot level. At this point there is a reef 75 feet wide; if this were mined in bulk it would yield probably $2·25, but by picking sections of it the grade is brought up to over $3. There is a small profit on this.

Gwin.

Gwin.—At present this mine is working on a fairly good body of ore. There are 80 stamps, and it is a well-handled and equipped mine. Present profits are fairly good. On the strength of this the owners wish to sell the mine in London for £600,000! This was the only mine on the Mother lode to which I was refused admission.

Keystone.

Keystone.—This mine has been worked continuously for fifty years. In earlier years, the richer ore was taken, and now the big bodies of low-grade ore remain. These are of great extent. The ore in sight is estimated at 2½ million tons, of a recovery value of $2·10. At present, with 40 stamps, the better patches are being picked, and the yield is brought up to just over $3. Expenses are $2·36. The mill is being increased in size.

Wildman.
Harvard.

Several mines I saw, such as the **Wildman-Mahoney** and **Harvard,** were being opened up with a view to working on a bigger scale.

Oneida.

The **Oneida** is a mine in which the Exploration Company is largely interested. Here the ore is of low value, barely $2·50 a ton, and the ground is unusually soft, and requires extra heavy timbering. Fortunately a new make of ore has lately been found here, which promises to keep the 60-stamp mill at work for some time, but the margin of profit is a small one. It is a well-run mine, but of no real value.

Glasgow mines—
Crystalline,
Nonpareil.
Jumper.

Several of the mines I saw are owned by Glasgow companies. Two of these, the **Crystalline** and **Nonpareil,** are as yet in an uncertain stage. A third one, the **Jumper,** has been for some years one of the most profitable mines on the Mother lode.

Ore reserves and profit in sight.

The gold in this mine is in a band of black slate, or rather in minute stringers of quartz, which run through the slate, and is often visible. There are 60 stamps which crush 4,000 tons a month, and on this [illegible] there is ore in sight to last for three or four years. [illegible] mine is disappointing. Though developed [illegible] ore has yet been found below 800 feet. Of course exploration work is still going on, and pay ore may be found in the bottom of the mine. But the nature of the formation, and the coarseness of the gold, makes for uncertainty. I venture to say that in driving the shallower levels further north, and exploring there, more pay ore will be found—down to, say, 600 or 800 feet.

In any case there is ore in sight for three or four years, which ought to give a profit, judged from past results, of nearly £30,000 a year. The mine appeared to be worked conservatively.

Other small mines on the Mother lode.

Such mines as the **Soulsby, Black Oak, Mount Jefferson, Alabama, Dutch,** and **Mazeppa,** which I saw, have only a local interest. Some of these are on the parallel lines of the Mother lode. They are all at present in the hand-to-mouth stage.

A summary of the field.

Interesting field as this is, I can only say again that I believe it is now being worked at no real profit. Most of the mines are shut down. Those that are being re-started have, admittedly, got to work ore that will yield not more than $3. After working costs and depreciation are deducted from this, the profit can only be a few cents a ton. Such mines as the Utica, Keystone and Oneida can work on this basis, because they have fine plants, paid for out of earlier profits, but if they had to face the problem of a total new equipment, I doubt if their owners would to-day take the risk.

The hydraulic industry to-day:

The hydraulic industry, which up to a dozen years ago, was adding a lot of gold to California's output, has been almost at a standstill. It was found that the *débris* washed down by the nozzles, and run through the sluices, was blocking up the rivers lower down, and overflowing rich agricultural land many miles away from where it had been broken down. In places this *débris* was piled up 30 feet high!

legislation affecting this.

Then came a big struggle at law between the agricultural and mining interests. It was decided that the alluvial mines could continue work as long as they did no material injury to the navigable streams or the lands adjacent thereto, but, as this was practically impossible, these mines had to shut down. This hydraulicing industry is now reviving in the northern part of the State, where there are big banks of gold-carrying gravel and rivers which are strong enough to carry away all the *débris* produced.

Gold dredging in California.

In Butte County, round Oroville, more than a dozen dredges are at work, and there are very extensive alluvial areas to be worked upon. These dredges, in the aggregate, are making profits, so much so that all the alluvial land in the district is now held at a big price per acre.

I believe this district, outside of Otago, N.Z., and perhaps spots on the west coast of the South Island, N.Z., is the only one where, as yet, dredging has been a success. In Australia it has failed completely; and though in nearly every country in the world an odd dredge or too is at work, not one in fifty has paid the cost of erection.

CHAPTER XI.

THE GOLD MINES OF ALASKA.

Alaska is purchased from Russia.

In the year 1867, when the American Government bought Alaska and all its islands from Russia for $7,200,000, a big party in the States was opposed to the purchase. In those days Alaska was looked on as almost uninhabitable; and if one reflects on the small good Russia had got by holding it, and were to take that fact as a criterion of its real value, the argument of those against the purchase was not so weak as it might now appear. Since that time the value of furs, fish and timber produced by Alaska, to say nothing of minerals, has yielded back the purchase price many times over, and in 1900, alone, the output of gold exceeded the figure of the total original cost of the whole country.

South-East Alaska:

South-Eastern Alaska, the narrow strip of land running up the west boundary of British Columbia, with its inland seas and thousands of islands, is not only one of the grandest bits of scenery in the world, but is also a region full of mineral and with quite unique facilities for cheap mining. These mining facilities are:—water power for at least the greater part of the year; wood for timber, or fuel, on the spot; water transit for the high-class coal from Vancouver Island; natural grade for moving the ore from the mine to the mill, and for getting rid of tailings; and bodies of ore that are usually above the normal in size.

its mining facilities;

But I draw the line clearly in speaking of the *value* of these ore bodies. There are at present in South-East Alaska probably a hundred ore deposits exposed, but less than a dozen of these can be called payable. Of the others, most are mere prospects as yet—some of them worth developing—while a number are already shown to be of no commercial value. Of course, when talking

ore values.

about ore values, the average Westerner is incorrigible—a liar of the purest water—nor does one go for the truth about Alaskan mines to the papers of the Pacific Coast; the only way to get at the facts is to go and see the mines oneself, and inspect the official assays, or take your own samples. This, as I have said, will show that there are many ore bodies—some of great size, but that on most of these not enough work has been done to show their real value, and as yet there are only a few really payable mines.

Nature of the ore.

The ores found in this region carry as their principal metals gold, gold and silver, and copper and gold. The small mining centres, from south to north, are Ketchikan, Prince of Wales Island, Sumdum, Douglas Island, Juneau and Berners Bay. Most of the mines are on one or other of the numerous islands, as the mainland, owing to the density of the forest and the presence of large areas of glacier on the mountains, has not yet really been prospected.

Mining districts.

Ketchikan.

Taking these districts in detail, Ketchikan may be described as having several low-grade gold mines, which have not yet paid for working.

Prince of Wales Island.

Prince of Wales Island is now being prospected extensively, and by syndicates which have enough money to carry through proper tests of the ore deposits lately found on the island. I believe that this centre will produce payable ore in course of time; but as the principal metal is likely to be copper—with gold only as a secondary product—it does not come within the scope of this book.

Sumdum.

At Sumdum a mine has been worked for some years. The mill is only of 10 stamps, but profits have been made. I did not see the mine, but believe there are not large reserves of ore.

Berners Bay.

At Berners Bay, on the mainland, there are several gold mines, which are erratic both in output of ore and in profit-earning. Some years ago these mines were doing moderately well; then came a period of no ore reserves and temporary closing down, and upon the head of that a series of lawsuits. I did not see these mines, but believe that they are not of importance.

Juneau and Douglas Island.

The two remaining centres, Juneau and Douglas Island, are the largest quartz-mining districts in Alaska; Juneau is on the mainland, quite an old mining town of 1,800 inhabitants, lying in the shadow of high mountains, while two miles away, on the other side of Gastineau Channel, is Douglas City and the Alaska Treadwell group of mines.

Early mining there.

In 1880 placer-mining began in the mountains behind Juneau, and in 1881 on Douglas Island. This island is 16 miles long and 8 miles broad at the centre. It is simply a mountain range standing out of the sea; the lower slopes are covered with fir trees, and the drainage of a tremendous rainfall flows down from the heights.

Discovery of Treadwell lode.

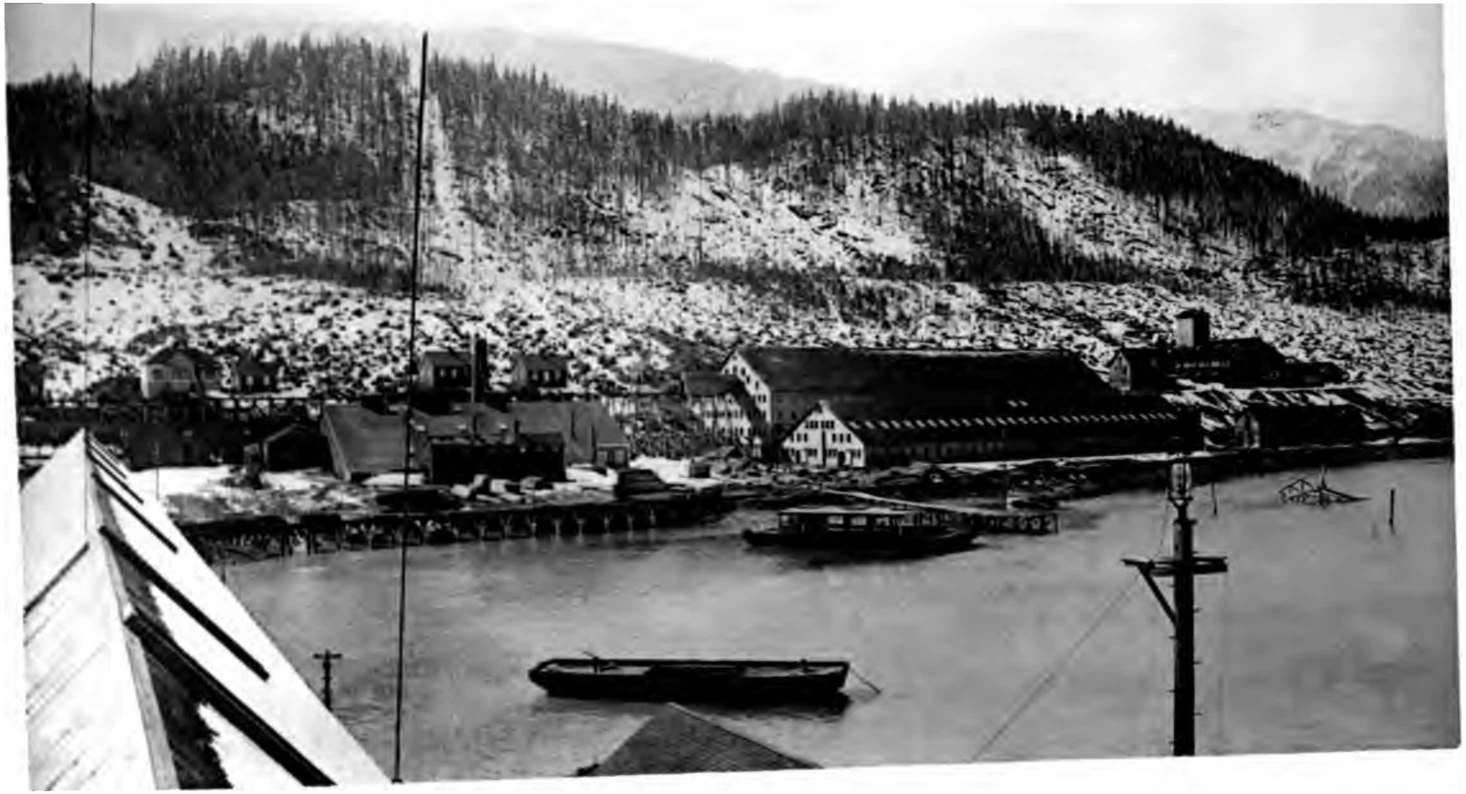
The placer workings, started in 1881 on the beach of Douglas, led up almost at once to a wide gold-bearing formation outcropping on the slope of the mountain only a few hundred feet from the sea shore. On this lode the Alaska Treadwell, Alaska Mexican, and Alaska United are now running 880 stamps, and their open quarries extend along it for more than a mile.

Size of the lode.

This immense lode, which geologists say is a true fissure, was in one place at the outcrop over 400 feet wide. It is in many other places along the surface 100 feet wide, and even at a considerable depth is found to be 80, 100, or even as much as 150 feet wide. Here and there, where the slate walls press in, it narrows to a mere stringer, and loses, too, much of its area by the intrusion of bodies of slate and diorite; but in spite of these contracted parts its bulk is truly colossal, and its continuance in depth seems assured.

Its geology.

The lode is a dyke of granite, altered to or highly impregnated with quartz, and carrying pyrites. It is free milling as to about 60% of its gold, and as the pyrites concentrate perfectly, it may be called an ideal ore to treat. As to the exact dimensions of the lode, it is difficult to define these. Its width we know, also the fact that it is going right down, but its length is not defined. It runs almost parallel with the beach, and is dipping under the sea at an angle of about 45 degrees. This holds good for nearly two miles in length; but at each end there is a blank and not enough



NEW 300 STAMP MILL OF ALASKA TREADWELL CO., DOUGLAS ISLAND.

work has yet been done to show what really happens beyond these points. Perhaps the slate walls simply close in again, leaving no sign of the great fissure, or maybe the lode continues on—but in a less metamorphosed condition. In this case its granite origin would show more clearly than its more recent quartzose structure, and naturally the free gold and pyrites would tend to disappear. In any case it may be noted that in the east end of the Treadwell and in the west end of the United—these points marking the extreme workings along the line of reef—the lode shows itself badly defined and with hardly any value; but these companies will have for years too much on hand to take up the costly work of exploring for doubtful extensions of the lode beyond these points.

Probable area of payable ore.

At work along the line of this lode are the Alaska Treadwell, Alaska Mexican, and Alaska United. At the time of writing this these mines are treating, all told, over 3,000 tons of ore a day and making a profit of about 1s. 6d. a ton; the value of the ore is about 8s. a ton. As these are figures with which hardly any other mines in the world can compare, I propose to show at some length how they are arrived at.

Capacity of the mines on the Treadwell lode.

Douglas Island is an ideal mining field, and a record in cheap working was indicated from the commencement.

Mining facilities.

Firstly, there is a great body of ore. This always means cheap mining; and in addition it is an ore easy to blast down and also to crush in a mill. Had the ore been rich it would all have to be taken out—which means a heavy cost for timbering, but as it is of low value, large portions can be left in for pillars without any cost and at no great loss.

Great ore body.

Secondly, the ore is most easily treated; something like 60% is saved in the mill as free gold, and after the tailings have passed over frue vanners, on which the pyrites are concentrated, hardly any gold is left in them.

Easily tested.

Thirdly, the tailings run direct into the sea and are swept away by the tide—disposing, naturally, of what is often an awkward problem. In the same way the fall between the mine and the mill saves labour in handling the ore.

Gravity.

Water power.

Fourthly, there is water power to drive most of the machinery for all the year, in the case of the Treadwell, and the whole of it for about eight months. Elsewhere in Alaska the water usually freezes in winter, but on Douglas Island it runs perennially. Water power also produces electric light for the mines, above and below ground, and compresses air to drive an aggregate of about 60 rock drills.

Water transit.

Fifthly, there is water transit to the mines, and a deep water wharf within several hundred yards of the shafts. This ensures cheap carriage of supplies from the south; but it is especially valuable for the bringing in of shiploads of the fine coal mined on Vancouver Island, and for the despatch in the empty coal steamers of concentrates to the smelter at Tacoma.

Management.

When to these unique facilities is added the best American work in mining and labour-saving, one begins to realise that the *ne plus ultra* of gold-mining is not far from being reached.

Alaska Treadwell. (Issued capital, 200,000 £5 shares.)

In describing at length the working of the **Alaska Treadwell** I cover, in the main features, the working of the other two mines, but will also deal with them more briefly afterwards. The Treadwell portion of the lode was in one place at the surface over 400 feet wide, and the mine has been worked extensively as an open quarry. Below the open workings there are already three levels, the lowest being at 440 feet, and during the next year the shaft will be sunk and several more levels opened. It was estimated some time ago that above the 440 foot level over 4,000,000 tons of ore were in sight; but, since then, big bodies of slate and unpayable masses of ore have been met with, and the estimate was reduced. It seems to me that in the earlier days the mine was not developed as far ahead as it should have been, nor was it assayed sufficiently.

Here is a mine crushing over 500,000 tons of very low-grade ore every year. To give reasonable security to shareholders—especially as it could easily have been done by slightly curtailing the profits—a reserve for ten years ahead, equal to 5,000,000 tons, should certainly have been built up. This is now being done, and by the end of 1903 I expect the reserve will be even more than this ; but it should have been done long ago, and the failure to do this somewhat detracts from the low working costs of a year or two back. The present item in the cost sheet of about 20 cents a ton for mine development, therefore, really stands for the current development, plus an extra monthly sum which is being put in to bring the mine into a more advanced state of development than at present.

Mine development.

Stamps.

The mine has 540 stamps—in mills of 300 and 240—but for four or five months in the year, owing to lack of water power, the 300 stamp mill does not run. The ore crushed per month varies from about 25,000 tons in the winter, with 240 stamps, to about 75,000 tons in the autumn with 540 stamps, when the water supply is at its fullest.

The 300 stamp mill.

The 300 stamp mill of the Treadwell is considered the finest in the world, for each stamp can crush 4½ tons of ore a day for about 6d. a ton. The ore is brought into the top of the mill by a small engine and the cars discharged automatically into a bin which holds 3,000 tons. It then passes through challenge ore feeders into the mortar boxes, where it is crushed by 1,020 lb. stamps, which have an eight inch drop, and 96 falls a minute. There is box amalgamation. The crushed pulp then passes through 900 mesh screens, over a 12 foot copper plate on to a six foot broad frue vanner—2 vanners to each 5 stamps—and from there direct into the sea, where it is dissipated by the tide. It may incidentally be noted that about 550 tons of ore are crushed by each shoe and die before they wear out.

Frue vanners.

The work of the frue vanners on the ore here is wonderful. In many places, notably at Johannesburg, this concentrating table has been superseded or thrown out, but on Douglas Island there are in all 352 vanners and they do the work almost to perfection. At the Treadwell the tailings now assay as a rule only [illegible] cents a ton, showing an almost perfect extracti[illegible]

Value of and disposal of concentrates.

The concentrates represent about [illegible] ore passed over the vanner. The[illegible] clean, and are worth about $4[illegible]

Tacoma, in Washington, and smelted there. The Douglas Island mines have made excellent terms with the Tacoma smelter, and also with the Wellington colliery on Vancouver Island. Coal is delivered at the Treadwell wharf for $5 a ton; duty, 67 cents; handling, 30 cents—say, $6 a ton in all. Then the collier loads up concentrates for Tacoma. The smelter there, being in need of the particular constituents of the Douglas Island concentrates, charges only $5 a ton for treatment, and returns, I believe, the whole of the gold recovered. The total cost of shipping and treating concentrates may be placed at $7 a ton, or about 14 cents per ton of ore.

Summary of three months' work.

ALASKA TREADWELL.

Summary of ore mined, yield per ton and profit per ton for April, May and June, 1901.

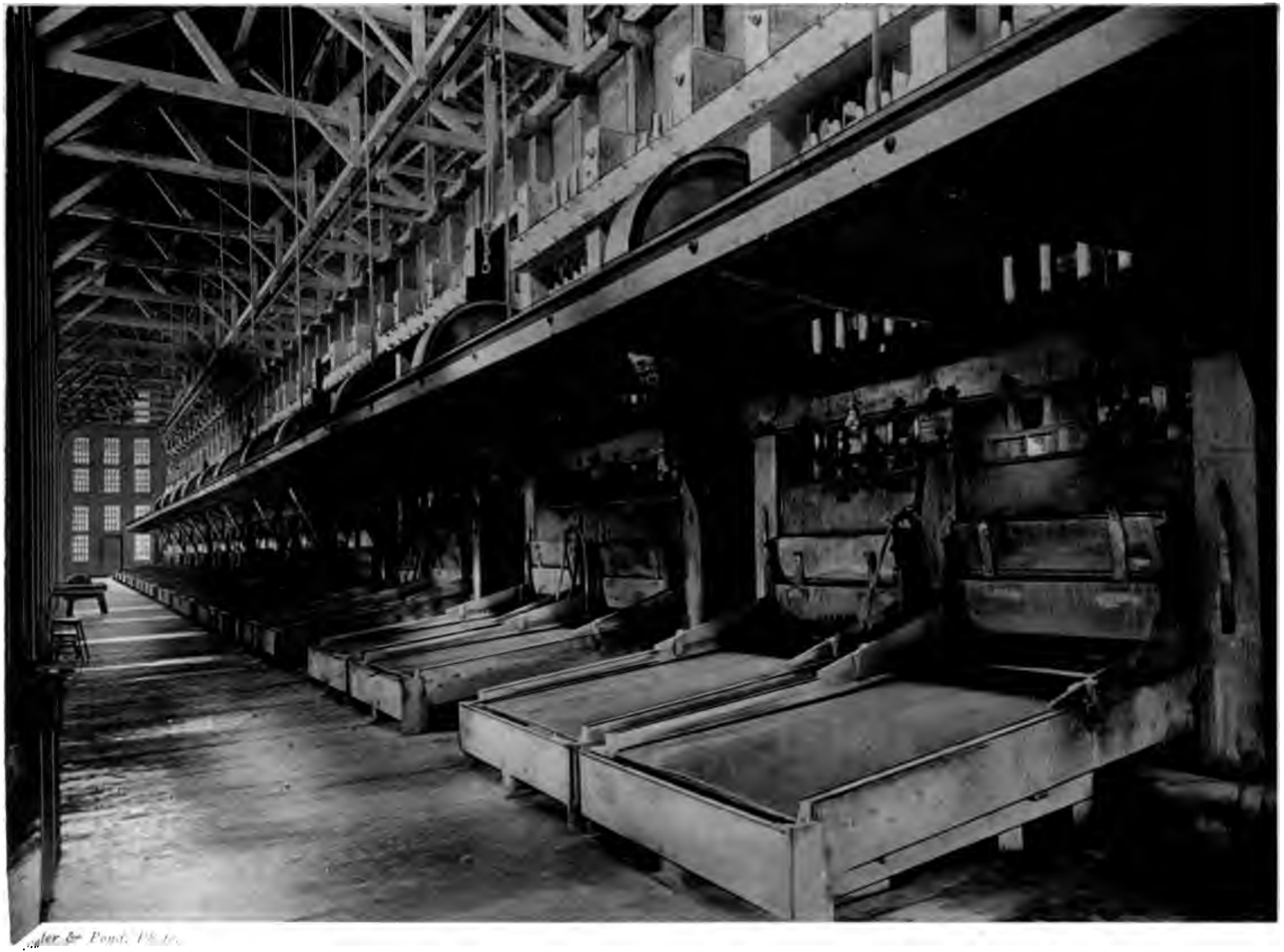
	Tons mined and crushed.	Yield per Ton, $.			Profit per Ton, $
		Mill.	Concentrates.	Total.	
April	34,339	1·168	·645	1·814	·306
May	55,443	1·159	·769	1·928	·821
June	54,555	1·079	·671	1·750	·533

The profit earned in these three months was $85,174—equal to 7% per annum on the capital.

Working costs.

The analysis of working costs over this same period is as follows:—

	Development.	Ore Production.	Milling.	Concentrating.	Freight and Treatment of Concentrates.	General.	Construction Account.	Total, $.
April ...	·271	·712	·287	·020	·132	·043	·039	1·508
May ...	·118	·546	·175	·018	·158	·003	·086	1·107
June ...	·136	·689	·143	·029	·132	·027	·057	1·216



ler & Pond, Photo.

BATTERY OF ALASKA MEXICAN CO.—DOUGLAS ISLAND.

Assay department of the group of mines.

A subject of great interest to me was the assay department of the Treadwell. In the earlier days of the mine far too few assays were made; the management assumed that, as everything had to be milled, there was no use to figure up values, and for months only an occasional sample of the tailings would be taken, and none from the mine itself. Now things are very different. There is an assay plan for every level of each of the three mines, added to weekly, and the ore going into the mill, and leaving as tailings, is even sampled in duplicate. A recent month's work at the central assay office showed 1,451 assays made; this was at the rate of 48 a day, and at a total cost of $347, or one shilling for each assay.

Assay results.

A month's samples of the ore after it reached the surface showed the following figures:—

	240 Stamp Mill.	300 Stamp Mill.
Sample taken at Crusher	$2·681	$2·825
Do. inside Mill	2·577	—
Do. Tailings in Mill	·048	·042
Do. Tailings outside Mill	·048	·044
Do. Concentrates	41·88	52·44

These tests are wonderfully uniform; when one considers the extreme difficulty of weighing a bead which represents four cents to the ton, you are inclined to accuse the assayer of some delicate guess-work; on the other hand, it is certain that the extraction in the mill and on the vanners is almost a perfect one, and the results given above, however arrived at, are probably nearly accurate.

Value of the shares.

Now let me show the value of Alaska Treadwell shares. As I have said, there are, roughly speaking, 4,000,000 tons of ore to work out above the 440 foot level. At that point, the deepest yet explored, the lode fully keeps up its value, and the assay plan even shows it to be slightly better than at the 330 foot level. But there is not so much reef, because a big slate band cuts out a lot of the ore and reduces the tonnage at this level by several hundred thousand tons. The area of payable ore here may be placed, roughly, at 900 feet long, and perhaps 150 feet wide. This slate band has been found at each level, of varying size, and I do not consider that its presence seriously affects the future. A more serious point is this. Coming in at the east end of the mine is a zone of almost barren ore, and here the footwall seems also to close in as if the lode still further east were dying out. This barren zone, from the surface to the 440 foot level, has dipped west several hundred feet, and has shortened the original length of payable ore by this much. So little is known of this end of the mine, that it would be unfair to say what this barren zone means until it has been explored; its present westward dip, too, may change at any time, but the fact serves as a timely warning to point the argument for active development in depth.

The 440 foot level.

Ore reserves are insufficient.

A mine like the Treadwell, to be worth investing in, should have six million tons developed *at least*, and I will show why. I suppose that from now, to the day the mine is worked out, the profit per ton will not be more than 75 cents, or say 3s. The shares are now nearly £5; to pay off that price, therefore, six-and-a-half million tons of ore must be treated, and—if we add interest—about ten million tons. I quite believe that this quantity of ore will be found in the mine, perhaps far more than this, but at the same time there are many gold mines in the world, where the purchaser at to-day's prices can see more of the market value actually in sight than is represented here by four million tons of such low-grade ore. The Treadwell is a wonderful mine, and an object-lesson to mining men, but it is not worth its market value of a million pounds, and could only be made so by developing far more ore than the directors have hitherto been satisfied with.

Profit per ton.

Summary of the mine's capacity and value.

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The **Alaska Mexican** is a Treadwell on a smaller scale. The reef is the same, except that it is narrower and more disturbed than in the Treadwell; it is mined in the same way, and the mill and frue vanners treat the ore with as good results; the battery is also built close to the sea, and the tailings are carried away by the tide. The ore is of much the same value as Treadwell ore—that is about $2 a ton, and working costs are only slightly higher than at the bigger mine.

Ore

The Mexican has 120 stamps, which crush over 150,000 tons a year, and by rights ought to have a million-and-a-half tons of reserves. But there is nothing like this quantity, and for the next two years a big amount of extra development will have to be done to make up for past remissness. The reef in this mine is badly squeezed in many places, and, although it opens out to as much as 100 feet wide, its bulk cannot be compared with the Treadwell. The really sound feature about the mine is that the ore in the lowest workings, both in size and in value, shows practically no falling-off, and when the mine is thoroughly developed the dividend may be increased. To date, about $600,000 have been paid in dividends.

Divi

The details of working are very similar to those at the Treadwell. For example, I noticed that the tailings after leaving the frue vanners, averaged less than 7 cents a ton; this was over a period of six months. The company has the usual water power installed, which drives the mine machinery most of the year, and generates electricity and compressed air all the year, and gets its coal and ships its concentrates in the same contract as the Treadwell.

The

The Mexican should have a fairly successful future. But, of course, until much more ore is in sight, the holder of the shares has not got the security which a mine of this size should be made to show. Until this state of development is reached the shares cannot be considered as intrinsically worth par.

Alaska United. (Issued capital, 180,200 £1 shares.)

The **Alaska United** is an amalgamation of the 'Ready Bullion' and '700 foot' properties, and has got 220 stamps. The mine is worked similarly in all respects to the Treadwell and Mexican, and is making profits, but as yet no dividends have been paid.

The '700' claim.

The '700 foot' claim is a bit of ground 700 feet long, lying between the Treadwell and the Mexican, and, therefore, not connected with the 'Ready Bullion' property, which forms the main area of the United mine. Only one-third of the 700 foot ground carries payable ore, that is to say, the 230 feet next to the Treadwell boundary; the rest of it is worthless. To work this 230 feet of ore the United has a separate shaft, and a separate mill of 100 stamps. Needless to say, the expense involved in this runs away with all the profit the ore might yield if worked in conjunction with a bigger area of ground. I saw the profit over a year's working of the '700 foot' claim figured out at only 4 cents a ton to the United, whereas if the same ground were worked in with the big stopes in the Treadwell the profit would be at least 30 cents a ton. I strongly urge the directors and shareholders in the Treadwell and United, therefore, to come to terms for the sale of the '700 foot' claim to the Treadwell. Its present position is a blot upon an otherwise soundly-handled group of mines.

Should be sold to the Treadwell.

Capacity and future of 'Ready Bullion' mine.

The 'Ready Bullion' property of the United is the most westerly spot along the line of the lode that has yet been proved. Here the reef bulges out again to quite 150 feet thick, but the effort does not last, and a length of 400 feet seems to exhaust the payable ore. The value of this mine is rather under the average of the others, but the size and value of the reef in depth seems to hold good. Here an incline shaft is sunk on the footwall of the reef; it is 750 feet deep, and is already out under the sea. At the bottom a huge reef shows in the cross-cut, but only a portion of it is payable.

Value of Alaska United shares.

I think the United will have a moderately successful future, but in the meantime the same policy of active development will have to be and is being carried out. The company should sell its '700 foot' claim to the Treadwell: and if it cuts down its capital by the extent of the price received, it ought to be able to pay a reasonable dividend on the remainder.

I have not yet dealt with the actual details of mining this wonderful deposit on Douglas Island.

Below the open quarries, which probably extend to 150 feet in depth, the lode is worked in the ordinary way, by levels 110 feet apart.

Method of mining the Treadwell lode.

We will assume that a given block of ore to be stoped is 500 feet long, 110 feet high, and 120 feet wide. The ore measures 13½ cubic feet to the ton, so that the quantity to be handled in the stope is about 500,000 tons.

No timbering.

Under ordinary circumstances, as, for example, at Broken Hill or Mount Morgan, a huge cavern like this as it was gradually opened would be timbered up, and then filled with waste rock, but the Treadwell ore is of too low grade to allow expense of either timbering or filling in of stopes. On the other hand, in a stope of this size, with no timber or filling to rest on, how are the rock drills to be placed in position? The miner may stand in the bottom of the stope and see seventy feet above him a face of ore a hundred feet thick, but if the intervening space is an empty cavern how is he going to cross it to get at the ore?

Pillars of ore.

The two main points, therefore, are:—First, to leave in pillars of the ore itself to afford the necessary safety to the mine: second, leave enough broken ore in the stope to act as a floor on which the miners can fix the rock drills. The first of these problems means that pillars of ore to the extent of more than a quarter of the whole ore in the mine must be left behind, and the second problem means that (broken ore occupying 20 cubic feet to a ton as against 13½ when unbroken) in a stope where 500,000 tons are blasted down, two-thirds of this broken ore must be left there until the last ton of ore in that stope has been blasted down.

Broken ore in the stopes.

Following out this method of stoping, the manager of the Treadwell expects to have a million tons of broken ore in the stopes in a few months from now, and this quantity will always be kept up. As regards the leaving of ore pillars, the method adopted is to leave a horizontal pillar, 15–20 feet thick over each level, which will probably never be taken away, and also vertical pillars in the stopes at irregular distances apart. The location of these vertical pillars is decided on according to the value of the ore—a poor patch being left in as a pillar—which is another example of the importance of assaying. Under the horizontal pillar, or floor of the stope, if the stope is very wide, several parallel drives are put in and raises or ore shoots put up from these into the stope. The stope is thus furnished with ore shoots not only down the middle, but towards the sides as well, and the whole of the broken ore, when the time comes to draw it, runs out without any shovelling. When a stope is emptied and it is seen that the roof is standing well, parts of the vertical pillars may be blasted down, and at a later stage of the mine's history it may be possible even to take away some of the ore in the horizontal pillars, but I estimate that at least 25% of the ore in the mine must stay in permanently as pillars and will not be recoverable.

Method of emptying the stopes.

Loss of ore in pillars.

Juneau district.

On the mainland, up in the mountains behind Juneau, there is another immense gold-bearing formation, which can be traced for some miles. It is a slate formation carrying seams and stringers of white quartz all through it, and is much wider than the lode on Douglas Island. Half-a-dozen small mines have worked, or are now working, on this formation with from 10 to 30 stamps, picking out sections on the footwall where the quartz shows in bigger bunches, and presumably paying expenses. But this is mere fencing with the ultimate solution, which I take to be the quarrying of the whole mountain sides through which the formation runs, and feeding several hundred stamps. The facilities are great; there is abundant water power for most of the year, a fine natural fall for handling the rock and getting rid of tailings; and the ore is free milling. As regards the essential fact—the value of the ore—I have seen assay plans of big areas of the ore which show at least a gross recovery value of a dollar to the ton, and my interest in the future of this great deposit was

Another huge lode:

facilities for working it:

Winter & Pond, Photo.

increased when I found that ore yielding a dollar, if worked on a sufficiently large scale, would pay well.

its value.

Alaska-Juneau mine.

The mine which will be the first to prove the actual value of this formation—taking everything and working as an open quarry—will be the **Alaska-Juneau**. This property belongs to the group which controls the Treadwell mines; it is under the same management, and its 30 stamp mill driven by water is now being used to sample big patches of the ore quarried out at different spots on the side of the mountain.

Here are the figures for the month preceding my visit to the mine—from ore taken from one given area, and constituting a test of the value of that particular part of the mountain.

Cost sheet of Alaska-Juneau.

ALASKA-JUNEAU MINE

RESULTS FOR MONTH OF AUGUST, 1901.

Tons Crushed		3,568
Yield per ton		$1·26
Costs per ton:—		
Producing ore	·60	
Milling	·22	
General	·22	1·04
Profit per ton		$ ·22

Future of the mine.

It is easy to see that if this mine could be run with 150 or 200 stamps working costs would not be more than 60 cents a ton, and I think the present series of tests will show that there are millions of tons which will give a yield of a dollar. I foresee that the Alaska-Juneau will buy up some of the adjoining ground to get a better outlet for its tailings, and a bigger head of water f machinery, and after that it will probably be reconstru enough working capital to erect 150 or 200 stamps. T make a most interesting mining problem—and I one.

It will be noticed in this cost sheet of th that there is no charge for concentrating the or were put in; but as the concentrates produ worth $20 per ton, and as the cost of production, cartage down to Juneau, ocean freight, and smelting, would have absorbed all of this, the idea of concentrating was abandoned. The tailings contain from 30-40 cents, but it is cheaper to let this go away, and to rely on the mill only for recovering gold.

Hydraulic mines.

The other mines on this line of reef have not yet tackled the problem in this wholesale way, and are picking the ore over for their small mills. In this same neighbourhood, known as the Silver Bow basin, there are two hydraulic sluicing mines—the Newell and the Last Chance—which find in the creek gravels the gold shed from the huge formation higher up in the mountains.

Alluvial mining in Alaska.

Apollo mine.

South-Eastern Alaska is now principally a quartz-mining district. Alaska proper is as yet only a placer or alluvial gold-mining field. The furthest distant quartz mine is the **Apollo Consolidated** mine on Unga, one of the Shumagin Islands, belonging to the Alaska Commercial Company. I did not see this mine, but believe that it is a heavily-mineralised vein carrying galena, zinc and copper pyrites, and has produced a large quantity of gold and silver.

Cape Nome.

Gold fields in the Yukon basin.

Passing into Alaska proper by the Yukon river, the mining man will stop at St. Michael's at the mouth of the Yukon and go 110 miles up the coast to Cape Nome. I did not see this part of the country, but believe Nome to be overrated, and already the claims pegged out along the beach are said to be worked out. Between the mouth of the Yukon, however, and the boundary of Canada up near Klondyke, there are a dozen or more alluvial fields which have paid individuals to work for years past, and which will be explored more and more in the next year or two. These fields lie on the Koyukuk, Tanana, Porcupine, 40 Mile, and other of the rivers which fall into the Yukon. There are also the camps of Circle City and Eagle, which flourished years ago, but which were nearly emptied when the rush took place to Klondyke. These fields are now reviving. At Eagle the **Alaska Syndicate,** a London company, is opening up a sluicing claim. I believe that the ground is of fair value here, but the lack of water for working on a big scale is felt. Mining men who have explored this part of Alaska, that is to say the basin of the Yukon, fear that the frozen ground which is always met with at a foot or two deep, no matter what the season of the year, will make hydraulic mining most difficult. This may be so, but over so great a stretch of country time is sure to unearth some quartz-mining problems of real value. In the meantime it is the country of the individual digger and the prospector, and to these men it furnishes at least a living.

CHAPTER XII.

THE GOLD MINES OF MEXICO.

Mexico.

Present yield of gold.

Mexico is now producing between 450,000 and 500,000 ozs. of fine gold a year. But of this, the greater part is found in complex ores of silver and copper—in which the gold is a minor product—and there are really only a few gold mines in the country.

Early mining in Mexico.

Mines have been worked in Mexico since the early days of the Spaniards—for over 300 years. These were silver mines, some of which are still being worked, and even now the output of silver is greater in value than, probably, that of all the other metals put together.

The gold yield is likely to increase.

This is a country which is expanding in many ways, and I believe a steady increase in the output of gold may be looked for. It is already one of the great mining countries, and is rich in diverse metals. The accessible mining districts—where silver has been the chief product—have been prospected by the natives for hundreds of years: but railways are now opening up new districts—covering great areas—which American miners, backed by American capital, are exploiting.

American capital.

Railways are needed.

Nearly all these mining fields—old and new—lie in, or not far from the main mountain range of the Sierra Madre. On the Western slopes miners are looking for gold reefs, and on the Eastern are found the more complex ore bodies. The States of Sonora, Lower California, Sinaloa, and Durango, on the west, are likely to show an increasing gold yield before long. Mexico is a field where the search for gold reefs ought to meet with success.

But as yet there are few gold mines in the whole country—and fewer still that are worth writing about.

El Oro gold-field.

The principal field is at El Oro, about 100 miles N.W. of the City of Mexico. The mines there turn out about a quarter of the country's gold yield.

Of the five mines now at work there, four are located on the main vein, and the other on a parallel vein some thousands of feet distant. Other parallel veins have been worked off and on for the last hundred years: from these the payable ore seems to have been worked out.

The main vein of El Oro:

The main vein of the district is a reef of unusual width, and has been opened up continuously for two miles. It is often 50 feet wide, and the streak of payable ore—which is generally on the hanging wall—varies from 5 to 45 feet. In places the reef branches into two or more veins.

On this line of reef are the El Oro, Esperanza, British Gold Mines of Mexico, and Mexico Venture Syndicate mines. These cover a distance of about two miles, and through all this length the reef is found. No doubt it continues beyond these limits, but because of the deep capping of andesite—volcanic overflow—which covers the country, it has not yet been traced. This whole length of, say, two miles, is not all payable ore; perhaps one-half is payable. The value is in gold, with about one-tenth of silver. The facilities for cheap treatment of this ore are good. There is water, wood fuel, timber, a railway, a natural fall for the surface works, a healthy climate, a superior class of native labour at a low wage, a large ore body, an ore amenable to ordinary treatment, and payable values spread over big areas.

facilities for mining here.

If in addition to this main vein, several of the parallel reefs turn out well—and there is reason to think they will—the El Oro field will have a great future.

Value of the main El Oro vein, and its possibilities in depth.

This main El Oro vein, down to say 500 feet, contains, or has contained, a good many millions of gold—so many, indeed, that one questions the probability of the gold lasting down for, say, another 500 feet. I believe—from the evidence of ore values—that the gradual change from payable to unpayable ore will take place somewhere between 500 and 1,000 feet, and that at 1,000 feet this main reef will not be payable. After all, this is what happens to nineteen reefs out of twenty. To a mining engineer the dying out of the gold in depth—the result of the natural processes which he understands—is no surprise. It is only a surprise to the distant shareholder—who is taught to believe that all mines should last down to 3,000 feet, and that his income from mining dividends will last a lifetime. For this false idea let him thank the company directors—whose interest it is to hide the truth ; and the financial papers—which are paid to keep him in the dark.

El Oro mine. (Issued capital, 980,000 £1 shares.)

El Oro Mining and Railway Company. The field is reached—from the nearest point on the Mexican National line—by a branch railroad belonging to the El Oro Company. This road continues on into the mountains and taps the company's large forest area, which supplies the mine with timber and the boilers with fuel. The other mines are also supplied, and there is a growing demand from outside centres. This railway is 32 miles in length ; it is yielding a profit of £2,500 a month, and is an asset of real value to the El Oro Company.

The mine has been worked for 100 years, but not on the main vein.

That reef, hidden under the capping of andesite, was only opened a few years ago, and the present company bought the mine before much ore had been taken from it.

The El Oro Company has earned large profits from the start, and its present ore reserve, on the main vein and its several branches, shows a net profit in sight equal to more than £1 a share.

The principal ore chute in the mine lies between the North Shaft and the boundary of the Esperanza mine—a distance of nearly 800 feet.

Ore reserves and profits.

This has now been driven on at the 486 foot level for several hundred feet, and in the Esperanza it is also opened close to the boundary. The ore in sight in this section down to this 486 foot level, as at January 1st, 1902, I placed at 400,000 tons which will give a net profit of £720,000.

EL ORO MINE, MEXICO

South of the North Shaft the main lode gets poorer. It becomes low grade ore; but a great quantity of it is payable, and to treat this I believe 100 more stamps—in addition to the 100 now at work—will be put up. This low grade ore has not yet been developed to any extent, but the work so far done warrants the belief that this south end of the mine is of great value. I take, as a certainty, 200,000 tons of low grade ore, which will give a net profit of £200,000, but a year's development work might easily turn this amount into a million tons!

On a branch vein in this part of the mine there is exposed about 50,000 tons of rich ore which will give a profit of £150,000.

To these ore reserves add the railway, which as an asset is worth at least £100,000.

These figures and values are, I am sure, accurate. They represent the value in sight at the beginning of 1902. Summarised they show:—

Total profit now in sight.

PROFIT IN SIGHT.

Between North Shaft and Esperanza Boundary, and above 486 foot level	£720,000
Low grade ore, south of North Shaft	200,000
Branch vein	150,000
Railway	100,000
	£1,170,000

Equal to nearly 24s. a share.

Further profits.

I think that to this figure shareholders are justified in adding a certain 10s. a share as the value of undeveloped ore. And for the following reasons:—

In the north block all the ore *above* the 486 foot level has been included in ore in sight; but none below that.

On this level the ore is still 15 feet wide, and worth 50s. a ton; but it is of less value than at the 386 foot level, and still less than at the 286 level.

This I take to mean a gradual dying out of values—a not unusual thing in mines at about this depth—but as a cross-cut from the Somera shaft will tap this ground shortly at 300 feet deeper than this level, it will be possible to prove, or disprove, this point. In any case the value of payable ore below the 486 foot level, even if it only lasts down for 200 feet, will be considerable.

Future possibilities of the mine.

In the south end of the mine, in the low grade ore, I expect a great tonnage—not now in sight—will be opened up. As I said before, this may amount to a million tons, or several million, and more stamps would have to be put up to treat this. This is the biggest prospective asset.

The branch vein, although not of great extent, is sure to yield more ore than that now in sight.

A possibility is the finding, by cross-cutting, of one or more parallel veins. One of these, the 'Descubridora' was worked many years ago to a considerable depth.

These possibilities I place as adding 10s. a share to the speculative value of the mine.

The deep level ground.

The deep level of the El Oro, known as the Somera claim, is under option to the company. It is estimated that the El Oro will lose its reef at 1,600 feet deep—at which point it would pass into the deep level—but, as has been shown, I believe the reef will have become unpayable long before that depth is reached. The El Oro is sinking a shaft on this claim, and from it is now putting in a cross-cut to tap the reef 300 feet below the present deepest workings. On the value of the reef at this point the option will be decided—one way or the other.

Working costs at El Oro are about 23s. a ton, and have now reached their lowest—unless the stamping capacity is to be increased. In American money they are :—

Working costs at El Oro.

Development	$ ·85
Mining	1·80
Milling	·80
Cyaniding	·90
Assaying	·06
Taxes	·54
General	·33
London Office and Management	·30
	$5·58

For 9,000 tons a month.

The ore now being treated averages about $17 a ton. Of this, about $1·60 is silver—most of which is lost. The extraction of the gold is 83%. From the mine and railway a monthly profit of about £17,000 is being earned.

Present value of the shares.

Finally, El Oro is a great mine. Its ore reserve—equal to a profit of more than the capital of the company—is a thing rarely seen in a quartz mine. There is a probability that a great deal more payable ore will be opened up, and that the mine will earn nearly £200,000 a year for a considerable time to come. The shares are worth, as a speculation, at least 34s.

Esperanza mine.

The **Esperanza** mine, adjoining El Oro on the north, is a Mexican company. It is a big gold producer. Part of the rich north chute of the El Oro is found here, and there are several other chutes of lesser value.

Ore reserves.

There is ore in sight to last for some years, but a good deal of the best ore is now worked out. I gathered the impression that the ore in the lower levels, while still of great extent, is not of equal value to that found above. Several times the mine has been under option—once at least to an English syndicate—but the price asked, about $3,000,000 gold, has always been thought rather out of proportion to the net profit in sight; so the deal has never gone through. The local owners have equipped the mine with 120 stamps, and a really fine surface plant. A new shaft is being sunk to the north, and the manager told me that both in this part of the mine, and that nearer the El Oro boundary, the deepest workings were looking well.

Mexico Venture Sy

North of Esperanza is the Mexico mine, belonging to the **Mexico Venture Syndicate**. The reef here is still the main vein of the El Oro district.

In the top two levels, the reef is of irregular value, and the andesite capping, dipping north, cuts it off near the shaft. But in levels 3 and 4, which have gone in underneath the capping there is a longer stretch of reef, with ore of better value. The faces in the north end of these two drives, when I saw them were in good ore.

The local manager's estimate to me of ore in sight was 70,000 tons, worth $15 gold, and a lot more worth over $10. He has proposed the erection of 40 stamps.

I think this promises to be a payable mine. But there is no necessity to erect stamps yet. The shareholders should put up enough money to purchase an efficient hauling engine, and good pumps, and develop, say, 200,000 tons of payable ore. This money, on present prospects, they are justified in raising. At a later stage, when there is a big reserve of ore, the stamps can be put up.

ritish Gold
ines of
exico.

At the south end of the field, on the main lode, is the Carmen mine belonging to the **British Gold Mines of Mexico.**

This mine is a disappointment. It was good down to 400 or 500 feet, and then went wrong altogether. On the 650 foot level I saw a fine reef, twenty feet thick in places, but quite unpayable. It is intended to sink one more level, but I have no hope that the ore will improve.

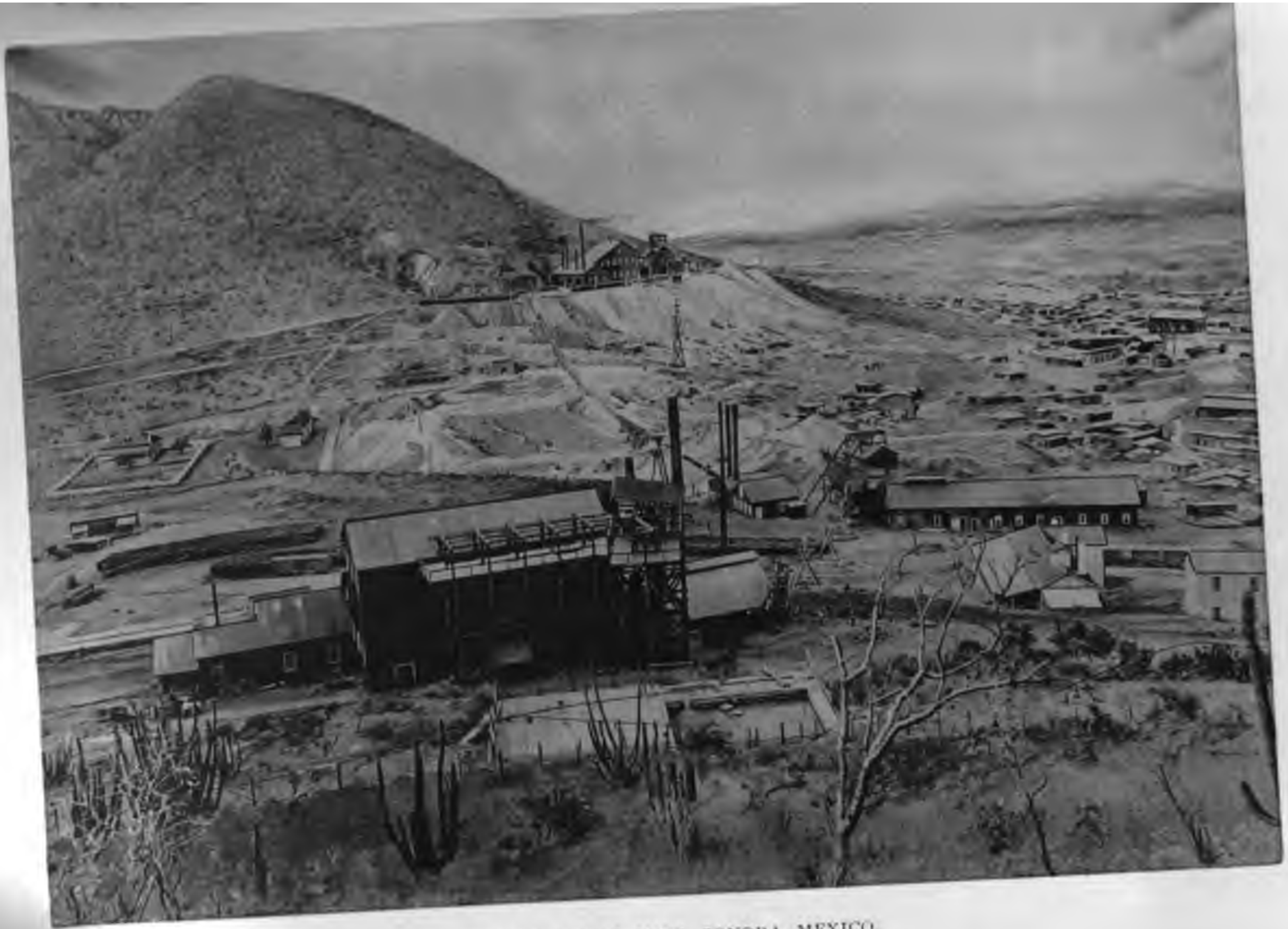
The payable ore in sight in the upper levels will last for one or perhaps two years more, but it will give no profit worth mentioning.

as Dos
strellas :

The **Dos Estrellas** mine is on a parallel vein, about half-a-mile west of the main vein of the district. Lately, in a tunnel over 2,000 metres long, this vein was cut. At this point it was 45 feet wide, and worth over $10 gold! On each side of this large vein were several smaller branches also carrying payable value. The content is gold, with, perhaps, 20% silver. At the level of this tunnel it is 650 feet up to the andesite capping. With a reef 45 feet wide, 650 feet of backs, and a length of about a mile, there can be no question of the amount of ore in this mine.

great low
rade mine.

As to its value, this vein and several of the branches have now been driven on for about 200 feet. On the whole the ore appears to be payable; the company—a local one—is crushing with 20 stamps, and 20 more are to be erected. If the present value of the ore continues over a biggish area, it would be possible



GRAND CENTRAL MINE, SONORA, MEXICO.

to work 200 stamps here. If reconstructed and liberally financed, this mine—assuming its values continue—might be turned into a great property.

The prospects of this mine, and the El Oro—and in a lesser degree the prospects of the Mexico and Esperanza—are likely to draw more attention to this field.

State of Sonora.

In the State of Sonora, on the west of the Sierra Madre, there is some gold-mining, but the mines are far apart, difficult of access, and have mostly a local interest only. At Minas Prietas there are two mines at work, the Creston and Colorado and Grand Central, that are worth writing about.

Minas Prietas.

The outcrops of a number of big lodes can be traced running parallel through this field for several miles. Some of these are barren, others have carried rich chutes of ore; but at a depth between 700 and 1,200 feet the whole district is underlaid by granite, and when the lodes reach the granite they are cut off altogether. It is said that at one point a lode has been found going down into the granite, but it had lost all its value. It may be taken for granted, therefore, that the mines will not last below 1,000 feet.

Grand Central mine. (Issued capital, 250,000 £1 shares.)

Grand Central. In this property there were three chutes—or I would rather call them big, irregular bunches of ore. These were worked at a good profit as far as they went, but when they reached the granite, at 800 or 900 feet, both the lodes, and the formation they were lying in, were cut off altogether. This mine is now worked out; when I saw it—in January, 1902—there were only two or three hundred tons of ore left to take out.

Ore bodies cut off in depth.

The company has a considerable cash balance, and is now doing a lot of development work on a large block of ground it owns about two miles distant from its old mine. Through this ground the same big lodes run. Their outcroppings on the surface assay poorly; but elsewhere on the [illegible] in several spots, rich ore has been found at a depth—where the [illegible] was poor on the surface—and I think there is [illegible] a possibility [illegible], when these lodes are cross-cut at a depth [illegible] hundred [illegible] and driven along, some good ore will be fo[illegible] case of a mine getting richer in depth—which hardly ever happens, but the deposition of the gold on this field has been eccentric altogether, and can hardly be judged by the usual standard.

rospects of ew ground.

On the whole, then, I think there is a possibility of good ore being found on this part of the property.

n over-apitalised nine.

The company's tailings are being treated on a royalty, and as these will not be worked out till the middle of 1903, an income will be received from this source. This tailings plant is doing good work, and the process of electric precipitation used is an improvement upon all previous methods. The Grand Central has been a well-worked mine. Its failure has come about because it was over-capitalised. It will have earned altogether about £200,000—but then its capital is £250,000 and there is the interest on this since the day of flotation to be reckoned as well. It is merely another example of the shrewd American selling us a mine for more than its value.

reston and olorado nine.

Creston and Colorado. This mine at present, after the El Oro, is the largest gold producer in Mexico. Its yield is probably 4,000–5,000 ozs. a month; but as it is owned privately no information about the mine is to be had. On the surface a fine chute of ore 1,200 feet long cropped out, and a big open cut shows where the ore has been quarried away. In depth, too, the veins worked in this mine run into the granite, but above that point I believe there is still a lot of payable ore to be worked out. This field, and El Oro, 800 miles apart, are the two principal gold fields in Mexico. There are other scattered mines—one or two of which are fairly good—but these are so far apart, and so difficult to get to, that they would not repay one for the time taken up. There is a crying need for at least one railway over the Sierra Madre, and for others from the coast towns, to go out in all directions. These will come some day. The mining prospects justify them.

onclusions.

CHAPTER XIII.

FLOATING MINES AND CHOOSING MANAGERS.

It may be said that three-quarters of all transactions in mining shares come under the head of gambling, pure and simple. The average gambler in mines cares nothing for the intrinsic value of a property; he does not study its past history, he does not intend to hold the shares for dividends—in fact, he wants to know nothing about the mine. All he asks for is a large profit on his speculation in a minimum period, and, credulous and greedy as he is, jumps eagerly at the first source of information that comes to his hand. The company promoter, and his myrmidons, who, in their turn, control a large section of the financial press, have, in these days, effected an organisation for the fleecing of these thousands of greedy, credulous gamblers, which is not only complete, but marvellously successful.

The gambling mania

The promoter forms a company: he issues a prospectus in flowery language, and to it attaches the report of a dishonest expert, or the report of an honest one with the unfavourable points left out: he prints off, for himself or his syndicate, 100,000 or 200,000 shares: he advertises the company by circular, or in the press by paragraphs which are paid for at ten times the rate of ordinary advertisements. If the mining market is strong, or if his company has been cleverly advertised, the shares which are to provide the vendor's proportion of cash, and the small working capital, are all applied for: if the market is indifferent they are only partly applied for—in any case the company proceeds to allotment. Here we pause for a moment, to inspect the share register of the newly-formed company. We note that the names of the hundred or two hundred proud possessors of the

is taken full advantage of by the promoter.

A prospectus.

Press paragraphs.

allotted shares are those of respectable proprietors or shopkeepers in the provinces: of gullible women: of retired officers: of even a curate or two: and of, at least, 25 orphans. But we note with a feeling of due respect that the name of not a single man who is reputed to be 'in the know' of the mining world, is included.

Allotment.

But the principal facts that have kept mining men of experience from taking shares in a company of this nature, are facts that are at the disposal of all. To begin with, assuming that neither the flowery language of the promoters, nor the hollowness of the report, nor the evil reputation of the expert who penned it, can be expected to show themselves to the scrutiny of the most ignorant class of speculator, the smallness of the working capital asked for *must* betray the nature of the undertaking. Everybody knows that a mine cannot be placed on a paying basis for £15,000—the sum we will assume as being provided—nor, indeed, very often for £150,000. Then, again, the list of directors who are to have control of what is assumed to be an important mining company, a concern which needs the application to it of great financial training and acuteness, to say nothing of mining experience, presents rather a ludicrous appearance. There is a lord, a general, an M.P., a knight, and two untitled men (or some permutation of the above), but not the name of a single well-known business man, nor that of a director connected with any successful mine. All of these directors may be honest and willing men, but it is only too evident that they utterly lack the necessary qualifications for their office: that they are merely the dummies or decoy ducks of the promoter (who, we assume, in this particular instance, is dishonest) and that, for their directors' fees, they cheerfully undertake the responsibility of successfully bringing to a profitable stage a mine which is hopelessly short of working capital. Now, already, we have noted points which, if carefully studied and acted on, would result in the collapse *before* flotation, of half the so-called gold mines that are now in existence.

How to detect a worthless flotation.

Working capital.

Directors.

But we must return to the promoter.

Promoter 'pools' shares

and 'rigs' market.

The company has gone to allotment. This fact, together with an appreciative paragraph concerning the company, paid for as before indicated, appears in next day's papers all over the country. Simultaneously an announcement is made that a Stock Exchange quotation for the shares has been applied for, and, as if to show the immediate recognition which the shares have gained in the financial world, a tape quotation appears showing them to be standing at one-eighth premium. As every share in the company, except those which have cost the applicants £1, is *pooled*, and lying securely in the safe of the promoter, and as the promoter knows that the people who applied for shares at £1 did so with the object of making at least 100 per cent. profit, it is a matter of the greatest ease for him to regulate the quotation up to any figure, so long as it does not bring these people as sellers into the market. Although there is little likelihood that any of the shareholders will sell their newly-acquired shares at a profit of a few shillings, and so spoil his market quotation, the promoter makes doubly certain by the introduction, in certain papers, of carefully-worded little paragraphs congratulating the shareholders on the fine prospects in store for them, and advising a still further purchase of the shares at a premium.

Tape quotations.

Simultaneously the shares are quoted on the tape at 25s. These announcements, together with the rapid, though not *too* rapid, rise of the shares on the market, bring in quite a number of new purchasers, who are now supplied from the promoter's
while the original, and now flattered, shareholders ar
ever resolved not to sell under £2. A month or
shares reach 30s. Those who have bought their share
this casually mention their success to their friends
eagerly wire to their London brokers for
shares. The pile of scrip in the promoter's s
ably lightened, and, to say nothing of the cash
received on flotation, he and his partners in t
netted a large profit. The history of the mir
onwards, need not be described. The pron

False assays are published.

A mill is ordered,

but there is no payable ore.

Reconstruction.

expects to get rid of the whole of its shares, but it occasionally manages to do so. An ignorant or a dishonest manager is put in charge of the property. If he searches carefully, he can nearly always discover some small bits of stone containing visible gold. Some of these are assayed, and the results, which, of course, are high, telegraphed to London: the remainder are shipped home to be exhibited to admiring shareholders. If interest can only be sustained in the doings of the company, and the general mining market continues good, few shares will come on the market. The directors announce that, acting on the manager's advice, a large battery has been ordered, and is in course of erection: this has a distinctly good effect on the shares. But in order to pay for all this machinery, the development of the mine is stopped. When milling commences the first month or two is sufficient to crush all the picked ore that has been set aside. It is found that the rest is quite unpayable, and as the company has no more cash to fall back on, the mine has to be shut down. This does not affect the promoter clique, but it is an unpleasant occurrence for the manager, and the directors, whose salary and fees depend on the existence of the company. The manager recommends that the 'highly promising' prospects of the mine be done justice to, in the shape of further development, and the directors enclose his report in an eloquent appeal of their own for reconstruction. This may be carried: some mines have been reconstructed oftener than once, but we are not at present concerned with what the shareholders may decide to do. They have lost once—heavily: the shares are unsaleable. And, yet, the whole fiasco might easily have been prevented by the use of a little common sense.

How to avoid the dishonest flotations.

We have already noted that people who are successful in mining, and there are not a few, do not go into mines of which the prospectus is uncertain, the directors dummies, and the working capital absurdly insufficient. Neither do they believe in newspaper paragraphs: they know that shares can be, and are frequently, *pooled*, and that, therefore, being subject to the pulation of one man only, they can be raised just as quickly

CARRYING MINING SUPPLIES IN THE ROCKY MOUNTAINS.

or as slowly as the operator wishes. To them tape quotations for shares of this description carry no meaning: lastly, and perhaps most important of all, should they, for reasons of their own, buy or subscribe for shares of this sort, they take immediate advantage of any rise in the price to quickly and expeditiously clear them all out, while the less experienced, having sown *their* seed, await with eagerness the fruition, which they have variously estimated at, some thirty, some sixty, and some an hundredfold. These mines, then, are gambles: their share certificates are equivalent to lottery tickets: through their agency a colony of company promoters and their cliques, resident in London, prey upon the savings of the nation, and it is largely owing to the machinations of these persons that the gold-mining industry has come to stink in the nostrils of so many thousands of people.

500 worthless mines recently floated in London.

I could with ease give the names of 500 gold mines floated during the last few years in London alone, which come under the foregoing classification.

Good mines are not offered to the public except at a high premium.

Another important point for the speculating public to remember is, that no mine with proved or really promising prospects is ever offered on the market except at a high premium. The valuable deep level areas at the Rand, which were known to carry payable gold before operations were ever commenced on them, were never offered to the public as were the outcrop mines. Their owners themselves were quite content to furnish the enormous sums required for their development, and it was only at a premium of from £2 to £10 per share that the public was afterwards offered an interest. Whether a mine is in Polynesia or Peru, so long as it can show payable ore, and good prospects, it will never come before the public in the ordinary manner. Take a case in West Australia. Some years ago, when the market was depressed, and the public thoroughly disgusted with that colony, a new mine, the Sons of Gwalia, [illegible] brought out. It had a large capital, and a large sum was [illegible] for working capital. But it was all su[illegible] the shares only appeared on the market [illegible] this was the fact that a large quantity [illegible]

An example of this.

and the prospects of the mine were very favourable. In any case the public was not asked to participate, except at 190 per cent. premium. Shortly afterwards, the Star of Gwalia and the something else of Gwalia were advertised. These mines had no payable ore in sight. Indeed they are located at some distance from the rich patch of the good mine, and may never have any payable ore at all. In this case the vendors allowed the public to participate at par, and were only too glad to do so, although no doubt their action, after the high-handed behaviour of the controllers of the neighbouring mine, appeared to be particularly generous.

The public is greatly to blame as well as the promoter.

While pointing out the havoc wrought by the unscrupulous promoter, it is only fair that the public should realise how seriously it is to blame as well. In the race for riches: for profits of 100 per cent.: or even for the excitement to be gained by speculation, the public simply plays into the promoters' hands.

How to estimate future flotations: the prospectus:

Here is some good advice to those who subscribe to gold-mining companies that may be brought out hereafter:—

Do not be guided by the prospectus, which consists of a string of eloquently worded inanities. Do not believe the report of the expert which is usually attached to the prospectus, unless it is that of a man well-known, of admittedly honest character, or, in the case of a stranger, unless the said report will bear the careful scrutiny of yourself and of such of your friends as may be experienced in mining.

the report.

The directors' titles.

Do not judge the capacity of the directors for conducting such an important concern as a gold mine, by their titles. The names looked for should be those of well-known business or commercial men in London or elsewhere: of directors in successful mines: of mining engineers, or the partners in well-known mining houses: and, most of all, the real magnates in the mining world, who will take care that their names shall not be mixed up, in a directorial capacity, with any company likely to be a failure.

The working capital.

Do not for a moment consider the advisability of taking shares in a mine which is not provided from the start with sufficient working capital. The smallest amount of working capital asked for ought to be £30,000 in the case of a speculative venture, and £50,000 when anything specific or definite is undertaken, such as sinking a deep level shaft, or driving a tunnel to locate the continuation of any reef. This sum must be in *cash*, not in the shape of half cash, half reserve shares. It should be understood that few mines can be developed and equipped on a sound scale even for £50,000. This sum is to be devoted to development only. If results are favourable a further large amount still remains to be provided by the shareholders.

The vendors' interest.

Do not favourably consider a scheme in which the vendors propose to annex 60 or 80 per cent. of the shares. As a rule, the unproved ground which is usually floated as a mine has only cost the vendors the price of pegging out and surveying, or at most £1,000. If the company in which you have applied for shares goes to allotment, make it your business to find out how much of the working capital stipulated for has actually been subscribed.

The allotment.

The press 'puffs.'

Do not, in the early days of a mine's existence, believe what newspapers or printed circulars say as to its success. It takes many months to prove a mine.

The tape quotation.

Do not, assuming that all the vendor shares are *pooled*, and that the market is being worked by one man, believe in the genuineness of tape, or Stock Exchange quotations.

The profit taking.

Finally, and most important of all: Be satisfied with a reasonable or even a small profit. When you decide to sell do not give your brokers a limit, slightly above that at which the shares then stand, but sell immediately, and right out.

Apply system to speculation and wild cats disappear.

Thus should the novice, or the speculator who has no accurate sources of information, conduct his gold-mining operations, at least when dealing with new and unproved mines. If everyone were to follow the rules laid down above, only about 20 per cent. of the mines now floated would have proceeded to allotment. Even then, of course, the speculator could not assure himself against loss, but he would greatly minimise the risk, and at the same time would have the satisfaction of dealing with the business in a common sense, and perhaps profitable manner.

Secondly, with regard to mines that are already floated, but in a doubtful condition :

To begin with, whether a mine is payable or worthless, a manager has to be selected. A good man, with a good record, especially a trained mining engineer, cannot be secured for the small salary which ignorant bodies of directors insist on offering to their managers, and the natural consequence is that an unsuitable man, frequently some novice who is a friend of one of the directors, is secured.

A trained mining engineer is not absolutely necessary to the ultimate success of a mine, but an experienced man most certainly is. To begin with, the property has to be surveyed, shafts have to be laid out, and their timbering designed. Winding gears and pumps must be ordered. A thorough knowledge of the mining laws of the country, and of accounts, is imperative. Then comes the most important point of all. The ore has to be sampled from the commencement, and on the results of this delicate operation the decision of the manager as to the whole future of the undertaking must be based. Here the most level-headed ex- [illegible] one with the soundest judgment and strictest [illegible] necessary to the success of the company. If the ore is [illegible] unpayable, and the reef itself not of a permanent [illegible] his duty to inform the directors, without [illegible] recommend the closing down of the mine. If [illegible] on continuing work, a manager with a name [illegible] resign. If, on the other hand, the ore proved [illegible] lying in a favourable formation, and in the [illegible] payable mine, the manager's duty would be to [illegible] that in all probability the mine would be a [illegible] same time, to recommend further mine develop- [illegible] third and last case, the ore when sampled was [illegible] but probably sufficiently good to pay if [illegible] scale, the manager has a difficult task [illegible] must lay the case fully before the directors, [illegible] further development of the mine, at the [illegible] expend all the company's funds in mine

A JOHANNESBURG MINE AT NIGHT.

development, except on such machinery as may be absolutely necessary.

The manager's honesty and strength of character is generally severely tested by the action of directors.

At once a cable, or letters, will arrive from the board, stating their wish, on the promising appearance of the mine, to erect a battery, and asking him to recommend such a course. Now comes the test of the manager's capacity and strength of character. If he is weak, and anxious to keep his place secure under all circumstances, he will comply with the Board's wish, and be the means of ruining a mine. If he is a strong and capable man he will realise, first of all, that the mine is not enough developed for him even to be certain that it will pay: that the company's funds are not sufficient for the full development of the mine—let alone for the erection of a battery: and that, finally, the directors, the dummies of the promoter, are guided in their desire, not by the interest they feel in the mine, but very often, by the interest which the controlling clique feels in the share market. The manager ***must*** realise that the course proposed is, in his completer knowledge of the subject, the worst course for shareholders, therefore it is his duty to firmly refuse to recommend the premature erection of a battery and other needless machinery, and to resign if still commanded to do so. But how many managers of poor or undeveloped mines can be found to take such a course? They are often inexperienced men: placed by circumstances in a position higher than they have been accustomed to: frequently the friend or nominee of the vendor himself—showing the utter fatuousness of the directors: quite incapable of either sampling a mine correctly, or framing a policy on the result of such sampling: most of all, incapable of carrying such a policy through. Such men hardly have opinions of their own: the directors' slightest suggestion is law. If they know that they are expected to cable home good assays, they do so, whether the ore assayed is found on their own property or elsewhere. If it is gently intimated to them that the ordering of a battery would have a cheering effect on the shareholders, the battery is at once ordered. Servility to the interests of the promoter clique is their motto. A man of this class clings to the mine and his salary to the very last, and,

What a manager of a poor or doubtful mine, if a man of weak character, is generally led to do,

and the results.

consequently, years often pass after the flotation of a mine before anyone has the slightest idea of its real value. At last the directors are forced to action by the disappointed shareholders: a well-known reliable mining engineer reports on the mine; it is found to be worthless, and is liquidated, but after the spending of many thousands of pounds that could have been saved and returned to the shareholders, had the company only possessed from the beginning an experienced, honest, and *highly paid* manager.

anager's cations

The manager appointed must, if possible, be a trained mining engineer, but, if not that, at least a man of experience, accustomed to control, and entitled to ask, and to receive, a minimum salary of £800 a year; a first-rate man would expect £2,000 a year, at least, but he would not take up the management unless the mine was a really promising venture. The manager appointed must in no way be connected with the vendor. It is a great mistake to postpone the selection of a highly paid manager until the mine is proved payable. An ignorant man, or one who allows the directors to dictate to him on technical questions, will cost the company thousands of pounds, and will never be able to gauge the exact value of the ore.

d salary.

Directors' instructions to manager.

A manager having been appointed, the directors' policy towards him must be laid down. He must be told that all the working capital of the company is to be spent in mine development only. The manager at the commencement of developing the mine, *is to engage the best assayer and ore sampler that can be found*, and an assay office, built to the plans of this official, is to be erected. *The mine is to be sampled every three feet*, the results are to be reduced to a full stoping width, and a duplicate of the assay plan is to be sent, from time to time, to the London office.

Course to be adopted if mine appears to be payable.

If the ore opened out after a year's development, or up to the time when the originally provided working capital of the company is becoming exhausted, is of good quality, there is no doubt but that the shareholders will authorise the directors to engage the services of a well-known engineer to report on the mine. Should he confirm the manager's favourable opinion, and the tale told by the assay plan, there is no doubt but that further working capital could easily be raised. This, if results were still doubtful, would probably be a small amount, and would only be devoted to further opening out of ore. But if the results were really good, a large sum of money should be raised: then tram lines and water races could be constructed, and the erection of workshops, air compressors, a battery, and such like would be undertaken. By this method, system would be introduced: a regular procedure in all similar undertakings would be brought about: and the public would feel that honesty and confidence were being restored to the mining industry.

How to spend the working capital

If the mine is a failure.

If the mine is a failure, and shareholders are in a position to find this out from the assay plan, as well as from the manager's reports, the company should be liquidated. As I have said there are many opposing interests against such a course. The promoter will no longer be able to manipulate the market, or to make fictitious quotations for the '*pooled*' shares: the directors will lose their fees, and (in the case of dishonest ones) their commissions: the manager his salary. This matter largely rests with the manager. If he is a dishonest or weak man, and in collusion with the promoter clique, he will recommend that the mine is good enough to warrant reconstruction—thus retaining his salary, and a continuance of his patrons' manipulations: if he is honest, he will recommend that the company be liquidated, and, what is more, will insist that a copy of his report, on so vital a subject, be placed verbatim in the hands of each shareholder. I have said elsewhere, that the manager of a gold mine is of more importance to the success of the company than all the directors put together. His honesty and integrity of purpose towards the shareholders, although he is nominally the servant of the directors, must be unquestioned, and the securing of a strong man, one who, if occasion requires, in the cause of right, will make himself heard beyond the walls of the board room, must be the first consideration for every mining company.

Shareholders must look to their interests,

and must insist on receiving th
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ve

The manager is the shareholders' greatest safeguard.

Provided he carries out all the board's policy, and possesses its confidence, the manager should be allowed entire control of all technical matters and of all expenditure. He should have full power to order his own machinery, stores, and such like, and, I think, might be trusted to effect a better bargain than many present day directors, fat rich men, most of them, who themselves insist on purchasing the company's requirements, receiving commissions all round.

CHAPTER XIV.

ETHICS IN GOLD-MINING.

The mine and the share market contrasted.

THERE are two very different sides to the gold-mining industry. One side—the mines, where good work is usually done in all departments, by capable and hard-working men; the other—the financial control and the share markets—where every man is against his fellows, and where lying, cheating, and the most gross selfishness only too often prevail.

To a certain extent this corrupt side of gold-mining can be purified. Whether this shall be, or no, depends much upon the small shareholder; I shall try to show him what he himself is able to effect.

Suggested reforms.

The first reforms I shall suggest refer to a greater accuracy in the handling of mining facts; reforms such as these shareholders should *insist* on.

The short ton.

The mining ton ought to weigh 2,000 lbs. In the leading gold-mining countries—South Africa, the United States, and in most of the individual big mines in Australasia and elsewhere—this convenient measurement is used; but in many English-owned mines all over the world—even in the Indian mines for example—the obsolete measurement of 2,240 lbs. is still adhered to.

The 2,240 lb. ton, of course, yields more gold than the ton of 2,000 lbs., and mine directors, with one eye on the share market, think to impress the public with this higher value of conten
This is the only reason I can see for the use of the long ton.
is only a step from this to actually instructing your mine manag
to 'cook' his tonnage, so that the grade of the ore shall not fa
under 1 oz.

'Cooking' the tonnage.

This 'cooking' of tonnage is a trick still common in Wes Australia. Of course the profit is the same, whatever the weigh of the ton may be, but the round figure is infinitely more convenien to use, and is now the standard measurement in the majorit of mines. Without this fixed standard, too, how incorrect appea the comparisons of working costs often made between mine or countries which work on different units of weight.

What a want of common sense there is about us, by th way: why do not we introduce the decimal standard in all ou business?

A fixed standard for bullion.

A still more necessary reform is the reducing all gol bullion to a fixed standard—that of fine gold. A bar of pure gold—1,000 fine—is worth within a fraction of 85s. an oz.; but by th inclusion in it of a little silver, or zinc from the cyanide process, o impurities of any sort, the value rapidly decreases. Thus, gol bullion from Johannesburg mines is worth about 75s. an oz., but i from the cyanide process only 60s.; in West Australia, a Kalgoorlie, it is worth about 80s.; but at Coolgardie, twent miles away, only 72s.; in Queensland it is often as low as 60s. and the Croydon bullion is worth only 30s.; in New Zealand i drops sometimes below 20s.; and in British Columbia, where th ore is generally smelted, the bullion value is returned as fine gol

[illegible]

Now, in the face of this, why should a mine secretary i London publish the bare statement that, for a given period, hi company has produced 1,000 *ounces of gold?* There is nothin to guide the enquirer. This bullion may be worth 82s. or 62s or 52s. an oz.: its value may mean all the difference betwee profit or loss, and yet, such is our slovenly system, this sort o statement is accepted by shareholders as satisfactory.

The correct way.

This most irregular method of valuation can be easily got ri of. Take, for example, the Waihi mine. There, owing to th presence of a good deal of silver, the bullion is worth less tha 80s. an oz. The monthly output is consequently something lik 40,000 ozs.; but as this is worth, not £160,000, but only £35,00 or so, the company sensibly makes no return of *ounces*, bu lishes the money value only. And so with American mines

All over America outputs and profits are simply stated in *dollars*; if the word ounce is used, it is understood to be an ounce of pure gold, *i.e.*, 1,000 fine, worth $20·67.

Witwatersrand Chamber of Mines.

The Witwatersrand Chamber of Mines—where I proposed this alteration five years ago—has at last adopted the scientific standard of valuation, so in future the outputs of all the mines in the Transvaal will be stated in ounces of fine gold. In Australia, at the end of every year, there is great rivalry among the different States as to which has made the greatest or second or third greatest gold output. The State that can reckon *the most ounces of bullion* is adjudged the winner. Thus, Victoria will announce an output of 850,000 ozs., worth perhaps 80s. 6d. an oz., but Queensland with 860,000 ozs., worth only 63s. 6d. an oz., will claim a higher place. Officials I have met, belonging to the Queensland Mines Department, have been noted for a lack of humour, but an incident such as this redeems them from absolute dullness.

Australian Governments.

Why not abolish troy weights in mining?

But we can go a step further than this. Why talk of ounces or pennyweights at all in gold-mining? If a man tells me the ore in his mine is worth 8 dwts. a ton, I have straightway to make a mental calculation of how much sterling is 8 dwts.; if I wrote a report on the mine all my estimates of ore values, working costs and profits, would be made, too, in sterling. The troy measurement is of no use in gold-mining, indeed it is a great nuisance; millions of calculations are made in a year, turning sterling into troy, and then back again into sterling, which are sheer waste of time. If a shareholder cannot appreciate the value of a mine because he is told that the ore yields 58s. 7d. a ton instead of 16 dwts. 5 grs. of bullion a ton, he had better sell out his shares altogether.

In America, where labour-saving is studied, the troy standard is of course abolished. An American mining engineer said to [illegible] 'It makes me tired to see the way you English [illegible] your [illegible] yields'—and I agreed with him. Let us, then, [illegible] in future publish yields of gold not in ounces but in sterling.

Irregularities in publishing assays.

In the publishing of assays there is much dishonesty, which I am afraid we cannot alter, and also a good deal of irregularity which *can* be altered. To make the publication of an assay of any real import not only the value must be stated, but also the width of reef to which it pertains. The secretary of a certain mine publishes the statement that a cable has been received announcing that a reef has been struck assaying 24 dwts. Over a good width this would be a highly payable result; but if only two or three inches thick it would be unpayable. The withholding of the context of the information, *i.e.*, the *width* of the reef, would allow unscrupulous directors to gain an unfair advantage in the share market.

Lying statement about assays.

A director, or official of a new mine, will often make the statement (either at a meeting or in print): 'Our assays go up as high as 4, 8, 15 and even 20 ozs. a ton'; but will carefully omit the fact that they go as low as 4, 8, 15 or even 20 grains a ton, and that so frequently as to bring the whole average down to an unpayable one. These sort of people should be tripped up smartly whenever caught doing this sort of thing.

As we have seen the uselessness of the troy measurement, assay values should always be given in sterling or in dollars—not in ounces and pennyweights. The width must invariably accompany the value.

The system of mining accounts—

The most important of this class of reforms, is that of mining accounts. I hold firmly to the belief that a mining company should only have one account—whether its name be 'Profit and Loss,' 'Receipts and Payments,' or 'Balance Sheet.' It should be made out each month, and embrace every payment or receipt during that period. From this a summary of the month's profit or loss on operations can be prepared. As at present constituted our mining accounts can be—and are frequently—so doctored that it is impossible to arrive at the financial position.

A mine will publish a statement showing a month's profit of £10,000. But from this will have been kept out the cost of a new boiler, the repairing of a shaft, the purchase of a pump, cost of developing ore, and all managerial and office expenses. All these items together probably total up to £4,000, so that

is shown to be bad.

the *profit* has really only been £6,000 for the month—not £10,000. But the directors will tell you that for the benefit of future shareholders, and to keep one month's costs similar to another, these items must be placed to capital account, or machinery account, or mine development account, etc., etc. Some day this mine will be worked out; but its accounts will show that the main shaft still stands in the books as worth £150,000; the property itself stands at £200,000; the machinery stands at £60,000; even mine development account, with a worked-out mine, has a handsome credit balance. And yet the property is valueless. The machinery can hardly be sold for old iron. The main shaft has got to be fenced round, being dangerous, and the mine development is represented by a dozen caved-in stopes.

Suggested reforms in mine accounts.

This is our present system of mine finance. The mine declares its profit of £10,000 a month—which is a lie—and our auditors gravely wink at the whole farce; the insiders, who doctor the figures, skip out; and the public, as usual, is left.

Let me again state that a mine's monthly or quarterly financial statement is not correct—is dishonestly put forth—unless *every* payment made during that period is included and debited against current profits.

The Homestake Company's account.

The Americans again—although I do not hold them up as a pattern of honesty in mining—have a better system of mine accounting than we have. I studied the account—it has only *one*—of the Homestake Company. Here is shown all payments and all receipts for the year; such academic rubbish as property account, capital account, main shaft account, and the like have no place in it. The Homestake account is the right sort for a mine, but it, again, errs on the side of the laconic. There is the bare statement of outlays; but as this is accompanied by no summary of these outlays—no analysis of working costs—the enquirer has to construct this himself from the account. English shareholders should adopt the Homestake system, but also [illegible] greater interest in the mine's working costs than do [illegible] shareholders in their mine.

Let us once more take note of these [illegible]

First. There is the mining ton, which should invariably be of 2,000 lbs.; this means, in other words, the decimal standard.

Second—is the reducing all bullion to the fine gold standard, and publishing returns only when so reduced. In this reform the Australian Governments might with advantage take the lead.

Third. Do away, preferably, with the troy weights altogether in gold-mining. State all values in sterling or dollars.

Fourth. When assays are published, the width of the ore must always accompany its value. The value should be stated in sterling, not in troy weight. Directors who make exaggerated statements about assays at company meetings, should be calmly but firmly removed.

Fifth. Our system of mining accounts permits of great deception. Such things as capital account, main shaft account, plant and machinery account, have no right to exist. In monthly statements of profits, the *real profit* is generally exaggerated.

Here is the imaginary monthly statement of a soundly-managed mine, drawn up on the lines of these proposed alterations. I think the introduction would be an improvement even to the Mysore.

A suggestion for the Mysore Company.

MYSORE GOLD MINING COMPANY.

STATEMENT FOR OCTOBER, 1902.

Tons (of 2,000 lbs.) treated 8,206

	£	Per ton s.
Yield of gold	47,318	115·32
Expenditure	12,938	31·53
Profit	**34,380**	**83·79**

NOTE.—Under the heading 'Expenditure' is included the development of 9,500 tons of ore, the purchase and erection of a tailings wheel, the purchase of new filter presses, and the erection of two white miners' bungalows. The profit of £34,380 is actually available for dividends.

MINE ASSAYS FOR THE MONTH.

2,700 foot level S. driven 18 feet, total 18 feet; reef 41 inches. Value 9·4 s.; 2,700 foot level N. driven 30 feet, total 56 feet; reef 17 inches. Value 14·8 s., etc., etc., etc.

The financial press:

One of the worst things of all in connection with gold-mining is the financial press, with a very few honourable exceptions. It is the chiefest channel of news between the man who deceives, and the public which is deceived; and I have no hesitation in saying that generally the paper for its own profit lends itself to what is dishonest. These papers are regularly subsidised by people who find them useful. Often, all that is required is a slight twisting of facts; more rarely, a suppression of the truth; but if necessary a series of downright lies is resorted to. The payment of these papers is made as being payment for advertisements, at perhaps ten times the usual rate, but in cases the proprietor or editor will receive options on shares or a regular cash subsidy.

its delicious optimism.

I imagine there are few people realise to what an extent this vicious system is carried on in London. Knowing as I do the real value of practically every gold mine in the world, it makes me sick to see the way in which, day after day, year after year, facts are distorted, bad mines are proclaimed good, scoundrels are praised, and lies sown broadcast. Over all there is a delicious optimism. The editor, who has perhaps that morning received his subsidy, or taken his profit on the option, or booked a new advertisement at ten times the usual rate, is at peace with all the world, and his message to his dupes is one of cheer and good-will. All mining shares, apparently, are about to rise, and keep on rising; every one is on the verge of making money; and it is a delightful world altogether.

The influence of manager and director compared.

The surest way to purify the gold-mining industry would be to increase the power of the manager—who stands for most of what there is of hard and capable work and devotion to duty—and thereby weaken the influence of the director—who only too often stands for intrigue, incapacity, and the baleful Stock Exchange influence
I should say, distinctly, that the manager typifies the
of mining, and the director—especially he of Lon
side. Of course, the financial side of mining is of
I am not depreciating it at all; nor is th
people should not buy or sell—bull or bear
content. All this can be done honestly.

director of a mine who starts this sort of game, uses information which he should not use; which he is paid by his company to turn to *its* advantage, not *his*; as against the outsider, too, he is playing with loaded dice.

lirectors
do and
not do.

No director should buy or sell shares in his own company. To make up for this he should be paid a good salary, and would have to take his work seriously. The average dummy director does no work. He is only a nuisance at board meetings; he talks drivel. If I were floating a mine, I should like the board to be composed of *three men only*, of mining or commercial profession. They would be well-paid—much more than a guinea a meeting—but would have to work hard, and take an executive interest in the mine's affairs, which directors rarely do at present. Even with a board such as this—of professionals so to speak—I would feel inclined to raise the status of the manager, so that his decision should weigh equally with that of any member of the board. How much more so is this necessary when we see the affairs of great mines handed over to the mercies of retired generals, lords, and the others of the species.

The
importance of
an honest
manager.

I again make the statement that the manager of a gold mine is of more importance in its success or failure than all the directors put together. His first qualification in my eyes is not brilliance, nor a great name—but simply honesty. It was a shock to me, when the West Australian intrigues came to light, to find that the managers of some of the biggest mines there were scoundrels. It is hardly an excuse for them that individual directors had joined in the swindling. But I am quite sure that on the whole the influence of the managers is for good—for more good than the influence of the directors. Why are mine managers not registered, like pilots, or doctors, or officers of a regiment? If the pilot runs his vessel on the rocks, or the doctor writes a wrong prescription, or the officer insults his superior—he is compelled to face an enquiry, and the restraining influence is a wholesome one; but the mine manager who swindles—with or without his director's knowledge, is only dismissed or asked to resign. No one criticises him severely, and next year he is probably managing a

Why not
register mine
managers?

mine somewhere else. Would not a severer standard of right and wrong—the censure of his fellow-managers—be an advantage in *his* profession?

And mine directors?

Why are not *directors* registered; and compelled by public opinion to follow a higher code of financial morality? This is rather a vast question, but, seriously, why not have Government registered or professional directors? A man of this standing, with mining and financial knowledge at his fingers ends, bringing with him the assurance that the company's affairs would be above suspicion, would be not such a bad asset to a mine. Supposing there were such men—officially licensed, knowing their business thoroughly—who would prevent the publication of false news, or the suppression of real news, –in a word, who would introduce and insist on honesty—would their services, even at £500 a year for each mine, not be in great request? I think they would.

The Government licensed director.

A certain shareholder once attended the first meeting of a gold-mining company. The chairman, who was also the vendor of the mine, owned all the shares except those the public had subscribed for. He was supreme in control, and had nominated his own creatures to the other six seats on the board. He made the following speech:—

'Ladies and gentlemen:

'This is only a statutory meeting called to comply with the legal regulations, so I will not detain you with a long speech. Next July you will be called together for the first regular yearly meeting. Then will be put before you all facts relating to the development of your mine. I think I may assure you, from what we already know, that these will be highly gratifying to us all. (This was a lie, as there was no favourable news from the mine, but several of the dummy directors said "Hear, hear.")

A meeting described at which are some strange happenings.

'You will notice that our shares are already quoted at a premium on the Stock Exchange. I may tell you, in confidence, that yesterday a broker came to me and offered me ⅛ above the market quotation for 2,000 shares, but I would not sell them.' (Loud clapping of hands, and a buzz of pleased excitement from the body of the hall. Here were more lies. Every share in the company, except those subscribed for at par, was lying at that moment in the chairman's safe. He himself made the nominal tape quotation every day, and it was his *own* order, given through another, that the broker was trying to fill.)

'Now, let me read you a report which arrived yesterday from our manager at the mine. He says—"Have driven 94 feet along reef at 50 foot level. The reef is a well-defined body," and in giving a list of the assays, taken every five feet, our manager shows values of 1 oz. 18 dwts. and 2 oz. 6 dwts. I need not tell you that on ore yielding 2 oz. 6 dwts. p r ton, we may look forward to immense profits in the near future. (Loud applause—a director, genuinely impressed, begins mak g calculations with a pencil and paper. But the chairman had ca fully omitted to give the whole list of assays sent by the manag r—18 of them. These, even including the two high ones esp ly picked out by the chairman, only *averaged* 6 dwts.—an unpayable value.)

'Only yesterday we received a cablegram from the manager, reading: "Have cut reef at 100 foot level. Assay value 16 dwts."' (Applause.) Here he again omitted to state that the cable included the additional words "width five inches," which showed it to be practically valueless. At this point, the secretary, knowing the whole contents of the cable, almost started up to contradict the chairman, but in time remembered that he had to support a widowed mother, so sat down again.

'Ladies and gentlemen,' the chairman continued, 'I am pleased to tell you that I have prevailed on the distinguished group of men you see on this platform to join our company as directors. (Cheers.) These gentlemen in their public capacities are so well known to you all that I feel they need no introduction; but to emphasize to you in what good hands the destinies of our mine now are, I will merely say that your board includes an earl, a privy councillor, an M.P., a general, and a colonial governor. (Applause.) Amid such a galaxy of talent, I feel that I have already said far more than I ought, and I will now merely put the formal proposals to the meeting.' (Loud clapping.) The Earl was about to rise to second the motion, when the certain shareholder we have taken notice of stood up.

He said: 'Mr. Chairman, before you put this motion allow me to say a word or two. I am a mining man by profession. I have mined all my life. I know the district where your mine is—I am not a shareholder myself, but am here with power of attorney of a friend who is a shareholder. I do not believe from my knowledge of the country that the reef is so rich as you have represented it. You read out only two of the assays. May I ask you what the others were? Another thing. I know the manager, who is a most cautious and conservative man. I am sure he did not give you the figures you have used, without any other smaller figures as well. Now let me go further. You congratulate us on the directors you have nominated. I propose that we do not accept these men, but choose our own directors. (Cries of "Shame.") Why should these men be put in charge of the destinies of this mine? They are all utterly ignorant of business, especially of mining business. The Earl is an undischarged bankrupt; so is your Privy Councillor. General ——— is over 70 years old, and is almost entirely deaf. Mr. ——— was kicked off the board of a mine last year for taking secret commissions. In any case all these men—for I have looked up their records carefully—are on so many other boards that they cannot possibly give proper attention to the affairs of our company. Now (turning round), ladies and gentlemen, I propose that we throw out the motion under consideration, and that we insist on all the directors resigning; and that we turn to here and elect our own directors.'

There was a moment's breathless excitement. No one knew what to do. And then, because we are a nation of snobs, someone hissed, and soon they were all hissing. A *Lord* had been spoken of in that way, and titled people! Would the people who had listened to this perhaps be looked on coldly by society? It was a most awkward situation! Here was at last a chance to follow the lead of a plucky man, and do something to set a memorable example in the world of mining companies. Several people in the crowd saw it. But they saw, too, that the opportunity passed almost as soon as it came. The scandalised shareholders were taken in hand by the chairman. Several of the directors made graceful little speeches in which they spoke in pitying tones of the man, and all the motions were carried with acclamation.

The man had disappeared; as he went out he muttered to himself: 'Thirty million, Carlyle said, but there's a damned lot more now.'

For a few minutes after the meeting the chairman and directors were busily engaged speaking to the reporters of some financial papers who had lingered behind.

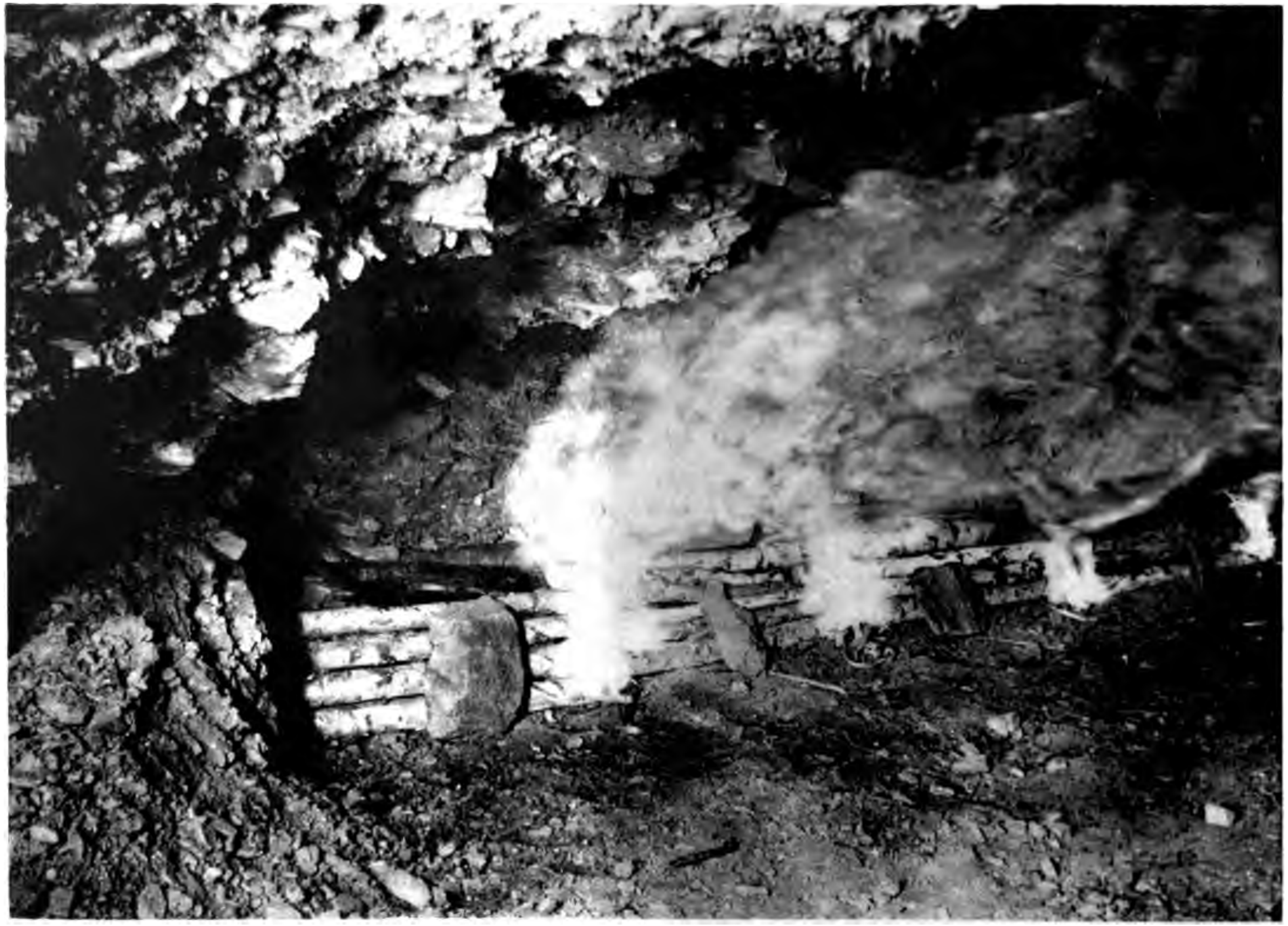
About an hour after this the chairman sat in his office; with him was the Earl. In the ante-chamber sat the Privy Councillor and the Colonial Governor. 'Mr. ——,' said the Earl, 'I hope you will let me exercise that option on the 2,000 shares. It will be a thousand pounds profit, and unless I get some money soon I'm done for. I've done a lot for you, too. By God! I've lied till I'm sick over these beastly mines.' 'You fool' was the reply. 'Do you think I'm going to give you an option on shares, and buy them back from you at ten shillings profit. You know there is no real market for the stock, and you calmly come and ask me to give you another thousand pounds. I cannot see you any more to-day. Send in the Governor.'

The case for dishonesty.

Let us now put the case for *dishonesty* in mining. Why, someone may ask, should not the man of ability, who has the means of getting secret, valuable financial mining information, not work for his own hand? In all paths of life the strong, able man who *knows* things come to the top, and the weak and foolish go down.

Evolution—the strong, able man and the weak fool.

It is evolution—simply the survival of the fittest—although the weak and foolish who lose their money, cannot be expected to see it in that light. And then, again, the millionaire, the promoter, the insider in the mining world, is not always acting dishonestly. This secrecy in many cases may be perfectly legitimate; his finance which appears to others inhuman, may be the only course open at the time. If he has even to deliberately lie or deceive,



Cantwell, photo.

THAWING THE FACE OF A DRIFT, KLONDYKE—THE OLD METHOD.

who knows but that we might do the same if we were in a like position? Ever, underlying it all, is the idea of evolution—natural selection. The battle is to the strong. It is the able man's destiny to come out on the top. Perhaps his methods were destined also. In the light of evolution perhaps this man is as moral as his less-gifted fellows. Why, too, should the newspaper proprietor not make all the money *he* can? He does not know anything about mines, or that the facts he prints are not facts at all. If the mining promoter pays him largely, does not he in turn benefit the promoter largely? People know that the press is not infallible; mistakes are liable to creep in. The man who pays a penny, or sixpence, for his paper, gets at least interesting reading for his money. If the proprietor did not get lots of advertisements, and perhaps even subsidies, he could not afford to run the paper at all. It would run at a loss and would have to be stopped. Surely the public wants a paper, even if not always giving absolute facts—rather than no paper at all. So you see his case is quite a strong one.

The case for the newspaper proprietor.

The case for the director.

And then, again, take the director's position. It is an understood thing that directors are in the way of getting valuable information. The world tacitly admits that this information may be made private use of. There is no secret about it. A director's position is, therefore, a valuable one. Rich and powerful men covet these positions, and of course get them. It is again the able man, —the strong personality naturally evolving himself. He, with his brains, is not going to sit there for a guinea a week. The unimportant shareholders should only be too glad to have the benefit of his talents. They are fools to think he is there only in ***their*** interest.

The arg further strengt

The casuist could strengthen this argument very much. He would point out to you, which you could not deny, that there is a strong natural optimism in all of us where a mine is concerned. How do we know that these big mining men are so often dishonest? They are human like others. May they not be deceived over a mine like others, too? Again, why should these men always be considering the interests of the public, or the small shareholders? It is well known that all these latter go into mining only to gamble. They do not care a hang about the mine's value; all they want is an inordinate profit over a short period. Have they, too, not had a hundred lessons and warnings? But did these ever do them any good? Each year sees a new crop of gullible and greedy fools come forward—'If you do not get out of my way I shall do you a financial injury,' says the big, able man to them. But they never heed; they press on, and surely enough they get the injury. And then another host is seen pressing forward in the distance, and it all begins again. So there is something to be said for the director.

A study in Ethics.

Let us analyse a particular case where directors, who are probably also rich men, might be accused of acting dishonestly, and yet might be wrongly accused.

At a board meeting a report is read from the manager at the mine. In it he says this—

'I have to inform you that the main shaft, which was being sunk on the reef, encountered a fault at 584 feet. The shaft is now sunk 12 feet in this fault or dyke rock, with no reappearance of the reef.'

This is quite an ordinary occurrence in gold-mining. It might be that the lost reef would be picked up again a few feet deeper, only slightly displaced by the fault, or it might be that the reef had been cut off altogether and would never be again found.

The chairman of the board believes in his own mind that the reef is lost entirely; and he proposes that the contents of the report be at once given to the shareholders.

Another director, and a very large shareholder, opposes this proposal. He points out that the reef is probably only displaced, not lost, and that its recovery is only a matter of weeks. He shows that the publication of the report would cause a big drop in the value of the shares; that many nervous holders would sell out at the lowest point; that immediately after this the reef might be found again; that the shares would then bound up to nearly their old price; and that the directors would promptly be accused of rigging the market. This is a perfectly logical argument, and eventually the board decides to adopt it. The report is, therefore, not published. But this director and large shareholder, who advanced good and honest reasons against the giving of this information to the public, holds the private view that the reef probably *is* lost. In any case the presence of this fault comes as a shock to him, with a consequent loss of confidence in the mine. His own shares at the then market value are worth £60,000. He had thought them worth that; but now it is a toss up; they may be worth barely £6,000. Why should he, he argues, stand by and watch them fall away to nothing, while if he only acts promptly he can turn all or most of them into hard cash. He is 63 years old. He may die. Ought he not to consider the future for his wife and family. Their welfare comes first before that of strangers. And so he sells his shares.

The solution of the problem.

The other directors, probably after a similar mental review of the position, also quietly begin selling. After two years exploring for the lost reef the search is abandoned, and the shares fall to almost nothing. In the meantime people accuse the directors of dishonesty, and there is no end of a row. Well, perhaps they *were* dishonest, but their accusers, if placed in the same position, would no doubt have done exactly what they did.

The director did not feel well.

Once, at a board meeting in Johannesburg, some very bad news about their mine was announced to the directors. A few moments later one of the directors was taken with terrible internal pains. Muttering hoarsely the word 'brandy,' he rose, and staggered to the door. But the chairman rose up like a flash and reached the door first. He locked it and put the key in his pocket. 'No you don't my friend,' said he to the suddenly recovered and astonished man; and then, in a firm voice, tapping the damaging report which he held in his hand, '*we will all reach the Stock Exchange together.*'

The moral of all this seems to be that, from the shareholders' point of view the director is a scoundrel, and from the directors' point of view the shareholder is a fool. Let God choose between them! Personally, the only advice I can give, is—'Do not buy mining shares—unless you can make a certain profit on them!'

CHAPTER XV.

GOLD MINING INVESTMENTS.

Reasons for pessimism rather than optimism in mining.

QUITE a number of people have said to me, 'You are far too sweeping in your judgment of mines. Speculation in gold shares is not such a risky thing as you show it to be.'

Some of these people have never seen a mine. The rest, perhaps, have not the responsibility of advising people when to buy or sell.

I have seen too many mines go wrong. I know of so many hundreds—capitalised in the market at big values—that have no real value at all. I see the thousands of sharks—with their organisation of deception—waiting in London for the unwary. My illusions are gone: I know that nine times out of ten the pessimistic side of a mining question is the right one.

Mines do not get richer in depth—they get poorer.

The one thing I want to show clearly is this—mines do not get richer in depth; they get poorer! A richer patch of ore may be found here and there in the deeper workings of a mine; such a phenomenon is an exception to the almost invariable rule.

The depths at which mines go wrong.

Of course, I do not mean that each level shows a steady falling off in value from the one above it. But the first five hundred feet of a mine will be richer than the second, the second richer than the third, the third richer than the fourth. Few payable ore bodies go down so deep as this. I have noticed that many mines get into unpayable ore at about 200 feet deep. Another depth that mines often go wrong, is about 800 feet, but, naturally, there is no law to guide one's judgment. We can only surmise as to how reefs were themselves formed. It is thought by some that the metals in them were deposited from solutions, or vapours, which percolated these cracks and fissures at perhaps a much later period. In some lodes the solutions seem to have come from above, but more often they seem to have come from below.

The reason for mines getting poorer in depth.

A person without knowledge of mines may say—' But if the solutions came from below, surely they would have deposited their metal contents all the way up, and the mine would, therefore, instead of getting poorer, become even richer in depth.'

The probable answer to this is that the metal-carrying solutions were under too great pressure, and heat, to deposit their contents. It was only when they had been forced up to near the surface—where the rock was cooler, and where, perhaps, they even encountered colder air—that the pressure was sufficiently relaxed, and the temperature sufficiently lowered to allow of a deposition of metals.

That, then, is the reason why a mine is richest near the surface, and gets poorer the deeper it is explored.

Examples of exceptional chutes of gold ore.

There are a few wonderful gold ore chutes in the world, that last down to great depths, despite the natural conditions against such a thing. But even in these one can see the gradual falling off in value.

Mysore.

The main chute in the Mysore is such. It is now exploited to 2,500 feet. At that depth the reef is still a fine regular body, but there is a gradual falling off in value as compared with shallower points.

Brilliant and Day Dawn.

The Brilliant and Day Dawn chutes at Charters Towers have carried payable ore to below 2,000 feet. But they, too, are beginning to show a gradual falling off.

Bendigo.

The Bendigo saddle reefs were often payable down to 2,000 feet. Below that only one here and there was any good. I inspected one of these at a vertical depth of 3,550 feet, but at that point it was quite barren.

In Colorado, at the Smuggler Union mine, there is an ore chute payable for probably 2,500 feet deep; but at that point the value shows a bare profit.

Of course the greatest gold ore chutes in the world are those at Johannesburg. Others are insignificant beside them. Here payable ore has already been proved to nearly 3,000 feet vertical—

equal to, probably, 5,000 feet on the incline—and it may last much deeper still. But even here the ore in the lowest workings shows a marked average falling off. I believe that the Rand banket reefs in this respect are like all other reefs. They are good down to a great depth, but they too probably become unpayable at last.

A list of some gold mines in which the ore gets poor in depth.

A list of the gold mines that do *not* carry payable ore to 2,000 feet, or even to 1,000, or 500 feet, would fill pages of this book. I do not mean by this the small or worthless mines, not worth taking into account at all, but *good* mines that have paid well or are still paying. I will give a few examples.

Mount Morgan.

Mount Morgan, in its present lowest workings at 650 feet, is much poorer than at higher points.

Waitekauri.

Waitekauri has unpayable ore in the bottom; there is a fine lode but hardly anything in it.

Kalgoorlie mines.

All the big producing mines at Kalgoorlie are poorer in depth than at the upper levels, and the ore chutes have contracted greatly. Some of them have gone wrong altogether.

Lady Shenton. East Murchison United.

Of profit-earning mines in other parts of the colony, East Murchison United and Lady Shenton are gradually giving out in value.

Rhodesian mines.

In Rhodesia no mines are yet really deep, but the failures even at shallow depths are numerous. In the Transvaal, among quartz mines, the Sheba has become poor in the bottom, and at the Rand

Sheba. The second-row deeps.

the second row deep levels show a falling off in average value.

St. John del Rey.

In Brazil a celebrated mine, St. John del Rey, is poor in the lowest part of the mine.

El Callao.

In Venezuela the El Callao, one of the best of gold mines, is now worked out.

California mines.

In California the mines on the Mother lode have got poorer and poorer. At no great average depth the value of gold recovered is now not more than $3 a ton.

Colorado mines.

In Colorado, the Stratton's Independence has gone wrong in depth.

The original Tomboy reef, too, is unpayable in the bottom.

Montana.

In Montana, the Montana mine was developed to 1,600 feet, but below 1,000 feet there was no payable ore.

Mexico.

In Mexico the Grand Central reef was cut out altogether in depth, and is now worked out.

British Columbia.

In British Columbia the War Eagle, Le Roi, and Centre Star lodes have got poorer in depth.

The mines I have noted are, or were, big profit-earning mines. I could mention many more. Of poorer mines that have failed at shallow depths, I could easily mention some hundreds.

Why do people say that mines do not get poorer in depth?

In the face of this evidence, furnished by the mines of the whole world, why does the company promoter, the dummy director, and the subsidised newspaper gravely assure us that mines improve in depth? Investors *must* get rid of this idea. Speculators may do as they please.

The nature of an ore chute.

When the investor or speculator understands the nature of an ore chute, its capriciousness, and the certainty of it giving out eventually—possibly at a much shallower point than 1,000 feet—he has learned the one great fact about gold-mining that he ought to know.

The next step will be to act on this knowledge.

The attempt to deceive people as to a mine's value.

He is soon brought face to face with the opportunity for applying it. The promoter, the director, the newspaper editor says to him in alluring tones, 'Here is a new mine which is going to pay 10% a year. It is getting richer in depth. It will probably have a life of many years, and later on increase its stamping power. In these days 10% is a splendid interest on money. There is two years' ore in sight. You should buy these shares at par.'

'10 % interest:'

Many people jump at an investment of this sort. They buy the shares at par, receive perhaps 1s. or 2s. in dividends, and then discover that the payable ore is worked out and the mine finished. For the probability of getting 10% interest for, perhaps, two years, they take the risk of the mine being able to produce payable ore for another ten or twelve years, to pay them back their money. But from what we have seen there is every chance that long before that the ore chute will have given out.

the risk people take to get this.

To make a share really worth buying, there should be ore in sight that will yield a profit not much less than the market valuation of the mine. But there never *is*, or very seldom, and that is why nearly all gold shares stand far above their real intrinsic value.

The Witwatersrand mines better than any others.

For the same reason, that is why the best Witwatersrand mines are so much better than other gold mines. They have actually got ore in sight that will pay back the market valuation of the mine, with interest in addition. These mines, as a group, are out and away better than anything else. Between these mines and the ordinary Rhodesian, Australasian, or American gold mine, there is the greatest possible difference.

Interest from Rand mines and other mines contrasted.

In the best Rand mines the investor who can purchase on a basis that will give him 10%—after allowing for redemption of capital—is doing well indeed; but to be satisfied with 10% in the average good mine elsewhere—unless the ore is actually in sight—is not good business at all, but only speculation. He needs, in this case, far more than 10%—to make up for the risk.

Mines recommended in first edition.

In the first edition—at the market prices of March 25th, 1899—I gave a list of 20 mines which I thought were the best investments and speculations at that time. I reprint this list—for the purpose of reference—and give some comments on the recent careers of these mines.

Name of Mine.	Price at 25/3/1899.	Remarks.
Waihi	£6	Shares went to 12½. Capital now increased. Dividends since paid about 20/- per share. Mine continues to look well.
Mount Morgan	5¼	Has since paid about 18/- a share dividends. Ore in sight for many years. Present price £4.
Brilliant St. George ...	3½	Has since paid about 34/- a share in dividends. Mine is looking moderately well. Present price 33/-
Associated	6	Shares rose to £14½, because of lying official reports. Present price £2. Mine is looking bad.
Great Boulder	1⅛	Shares went to 1⅞. Present price £1. Has since paid about 5/- in dividends. Mine continues to open up well.
Kalgurli	7	Shares went to 14. Present price 4. Has paid 2/6 dividend. Mine only looks moderately well.
Sons of Gwalia	2	Shares went to 6. Now 1¼. Has since paid 4/- in dividends. Mine looks fairly well.
Le Roi	5½	Shares went to 9. Now 3½. Mine is not looking well.
Ymir	¾	Present price 1¾. Has since paid about 5/- in dividends. Mine looks moderately well.
Progress, N.Z.	1⅛	Shares went to 1½. Has since paid about 6/- in dividends. Mine is looking only moderately well.
Village Deep	6¾	Present price 6¾. A deep level mine. Work not yet commenced.
Robinson Central Deep	3¾	Present price 4¼. A deep level mine. Work not yet commenced.
Selukwe	2½	Shares went to £3. Present price 2¼. Mine looks well, but no dividends paid yet.
Nigel	3½	Present price 3¾. Mine looks well.
Ooregum (Pref.) ...	4¼	Shares went to 5½. Dividends since paid about 10/- a share. Mine looks well.
Champion Reef ...	4¾	Present price 5¾. Dividends since paid about 25/- a share. Mine looks well.
Mysore	5	Present price 6¼. Dividends since paid about 25/- Mine looks moderately well.
Wemmer	12¼	Present price 14¼. Large sum of cash in hand. Mine looks well.
Globe and Phœnix ...	4	Went to £6. Present price 4⅝. Paid 10/- in dividends. Mine looks moderately well.
Rose Deep	9½	Present price 10. Mine looks well.

Results from these to date.

This list now cancelled.

To have bought some of each of these shares in March, 1899, and to have held them to the present would have yielded a profit. If they had been sold out at about the highest prices reached, the profit would have been a large one. This list may now be taken as cancelled.

Recommendations for the future divided into the best Rand mines and those of other fields.

For the future, if deliberately advising the purchase of any shares, I wish to draw a clear line between the best Rand shares and all others.

These Rand shares that I shall mention are *certainties.* But they only yield interest. There is little speculative value about them.

A list of these shares, and the prices I believe them to be worth (as at the beginning of 1902), are as follows:—

The best Rand mines.

Bonanza	£6	Jubilee	£7⅞
Crown Reef ...	15¾	May Consolidated	5¼
Durban Roodepoort	5¾	Primrose	5⅛
Ferreira	26½	Robinson	10
Geldenhuis Estate	8¾	Salisbury	3⅝
Heriot	8	Treasury	6
Henry Nourse ...	10½	Wemmer	14¾

Interest on these.

These are the safest mining investments in the world. If the investor will take as interest 5% on his outlay, and set the rest aside for redemption of capital, he will most surely come out well in the end.

Many of the other Rand mines are quite good; but the shares of these nearly always stand above their true value. In course of time some of these, when more fully developed, may be found to rank in soundness with those already named. Of these mines, I consider Meyer and Charlton worth buying to hold at £6, and Village Deep at £7, Robinson Central Deep at £4¼, and Van Ryn at £3 worth buying to take a profit on. The Nigel mine, at Heidelberg, I consider has as good prospects as any of these second class Rand mines. The shares of this mine are worth more than the present price of £3½.

Here is a list of mines in other parts of the world that I think are now worth buying into, at about the prices mentioned.

There are other good mines, the shares of which, on ore in sight, are likely to rise.

These are some of the best or most promising gold-mines outside of the Rand. The shares of some of these mines —because of the amount of ore in sight—are almost good enough for investments. But as such I do not put them forward. I say to the purchaser ‘the shares of these mines are likely, sooner or later, to go up. If you buy now, take a profit. Do not hold them permanently; if you sell, and the shares fall to the original price, buy in again.’

These are the mines :—

A list of these.

El Oro	30/-	Waihi	5½
Tomboy	40/-	Great Boulder	20/-
Montana	3/6	Brilliant Central	3¾
Consolidated Mercur	$1·50		

A final warning.

For well-located mines, likely to be of considerable value in course of time, the speculator should buy, and lay away, the shares of Bonnie Dundee, Goldfields of Mysore, and Waihi Grand Junction. These are speculations, but they are based on strong probabilities.

Buy when the market is weak. Sell when it is strong. Remember that ore chutes always give out sooner or later. Remember that in any mining question the pessimistic side is right nine times out of ten. Do not gamble in rubbish. Buy rather the best Rand stocks, or those in the above list. On these lines a careful speculator will probably come out on the right side in the long run.

THE END.

APPENDIX.

The Appoximate Monthly Output of the 50 Biggest Gold-Producing Mines.

Name of Mine.	Where situated.	Monthly Output of Gold.
Simmer & Jack	Witwatersrand	£78,000
Homestake	South Dakota	75,000
Robinson	Witwatersrand	62,600
Rose Deep	"	58,600
Portland	Colorado	57,000
Mount Morgan	Queensland	56,000
Golden Horseshoe	West Australia	56,000
Geldenhuis Deep	Witwatersrand	51,500
Mysore	India	50,000
Boulder Perseverance	West Australia	50,000
Crown Reef	Witwatersrand	47,900
City & Suburban	"	46,100
Village Main Reef	"	46,100
Crown Deep	"	46,100
Champion Reef	India	46,000
Ferreira	Witwatersrand	44,400
Ferreira Deep	"	42,600
Geldenhuis Estate	"	41,900
Ivanhoe	West Australia	40,000
Lake View	"	40,000
Angelo	Witwatersrand	38,300
Great Boulder	West Australia	38,000
Langlaagte Estate	Witwatersrand	37,300
New Primrose	"	37,300
Waihi	New Zealand	36,000
Robinson Deep	Witwatersrand	35,500
May Consolidated	"	33,000
Stratton's Independence	Colorado	32,000
Glen Deep	Witwatersrand	31,900
Jumpers Deep	"	30,200
Le Roi	British Columbia	30,000
Bonanza	Witwatersrand	29,100
Driefontein	"	29,100
Henry Nourse	"	29,100
Langlaagte Deep	"	28,400
Van Ryn	"	28,400
Ooregum	India	27,000
Wemmer	Witwatersrand	27,000
Nourse Deep	"	27,000
Alaska Treadwell	Alaska	26,000
Glencairn	Witwatersrand	25,600
Durban Roodepoort	"	24,500
El Oro	Mexico	24,000
Transvaal G.M. Estates	Lydenburg	23,100
Camp Bird	Colorado	23,000
Gold Coin	"	23,000
Great Fingall	West Australia	23,000
Consolidated Mercur	Utah	23,000
St John del Rey	Brazil	22,500
New Kleinfontein	Witwatersrand	22,400

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ASSAY PLAN OF A MINE.

THIS copy of a Rand assay plan—similar in details to the assay plans of almost every mine on the Witwatersrand—is commended to the attention of shareholders in mines in Australia and elsewhere.

Many mines are conducted in a haphazard way; ore values are often guessed at, or assays are taken here and there without system. Not one mine in fifty has a plan of this sort.

A quartz reef is of course more difficult to sample than a banket reef, but this can be partly got over by taking bigger samples, and at shorter distances apart. I believe in sampling a quartz reef *every two feet*. If this is done from day to day, as the mine is being developed, it gives most valuable evidence to the manager. If it is delayed for a year or two, the figures then disclosed may result in the manager's dismissal, and in an enquiry as to the directors' fitness and honesty.

The London office of every mine should have an assay plan of this sort. Every month it should be filled in up to date, and every three months the total quantity of ore in sight and its value worked out. Then, if results are higher, or lower than they ought to be, from the evidence of the plan, steps can be at once taken to find out what is the matter. If the manager cannot show, approximately, the results indicated by his assays, shareholders will want to know the reason why.

ASS